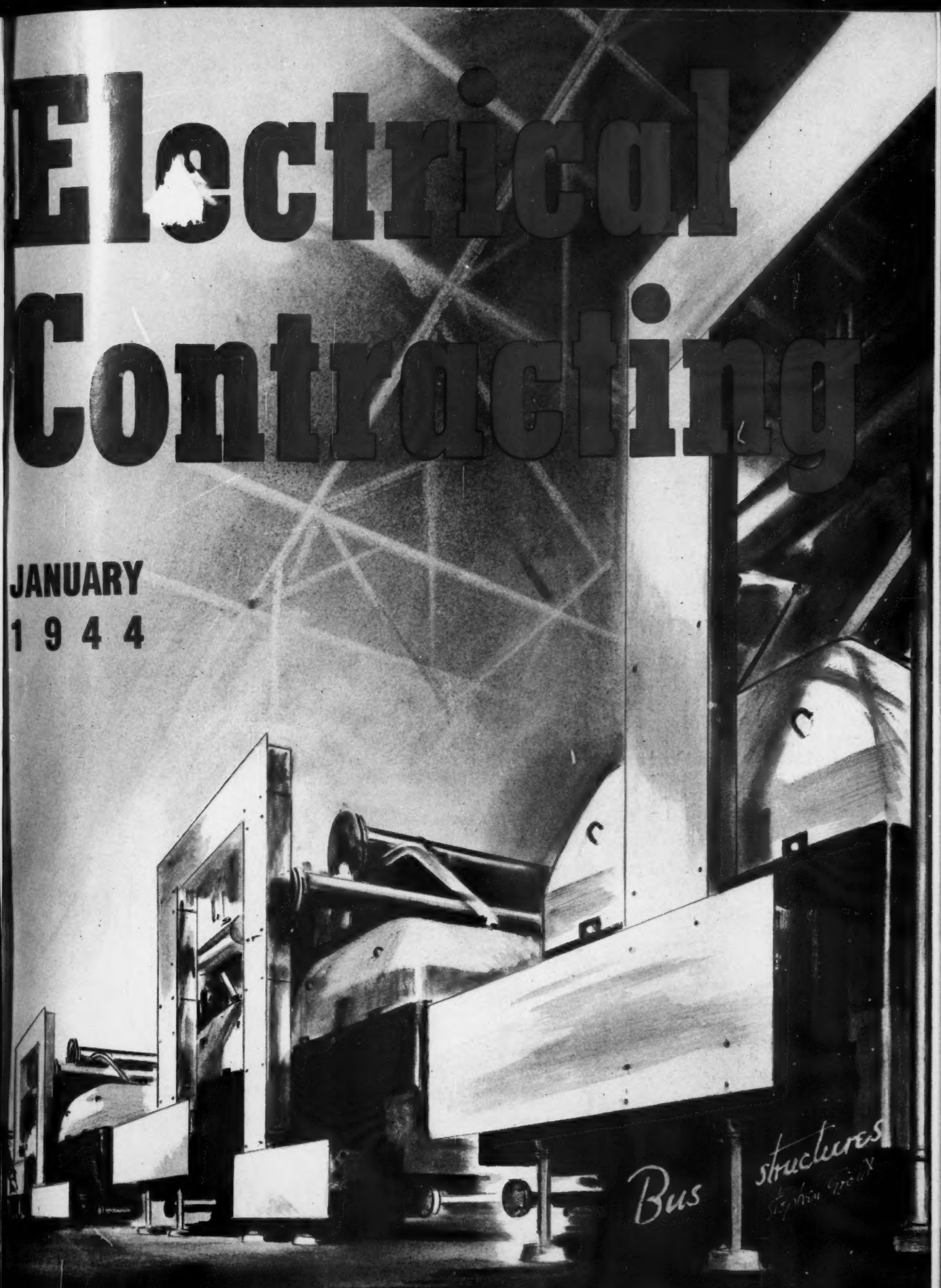
Electrical Contracting

JANUARY
1944



The Magazine of
ELECTRICAL CONSTRUCTION AND MAINTENANCE

Seven-year Burial proves superiority of FLAMENOL INSULATED CABLE

After seven years in series-lighting service, buried directly in the ground, this two-conductor, concentric No. 8 Flamenol cable is still as good as new.

FLAMENOL'S LASTING PROPERTIES GIVE LONG, ECONOMICAL SERVICE UNDER SEVERE OPERATING CONDITIONS

More than six years before Pearl Harbor, an Eastern power company made a direct-burial installation of Flamenol cable. After seven years' service, part of it was removed and the insulation was tested—with these results:

Physical Condition: *Excellent*

Insulation Resistance: *336 megohms per 1000 ft*

Tensile Strength: *2560 lb per sq in.*

Elongation: *220 per cent*

Many thousands of feet of Flamenol have since been installed underground for series lighting and 600-volt power circuits. Tests after varied lengths of service show that physical and electrical characteristics of the insulation remain practically unchanged.

Specially developed for severe operating conditions

Years before any rubber shortage, G-E engineers turned to synthetic resins for improved cable insulation. Flamenol, the first such cable to be utilized commercially, proved vastly superior to rubber-insulated cable for service under adverse conditions.

Today, after years of constant development, Flamenol cable offers a wide range of operating advantages:

FLAME RESISTANCE

Does not support combustion.

CORROSION RESISTANCE

Immune to action of oils, acids, alkalies.

AGING

Does not oxidize. Highly resistant to sunlight and weathering.

PHYSICAL PROPERTIES

Tensile strength, 1500 lb per sq in., minimum. Elongation, 100 per cent, minimum.

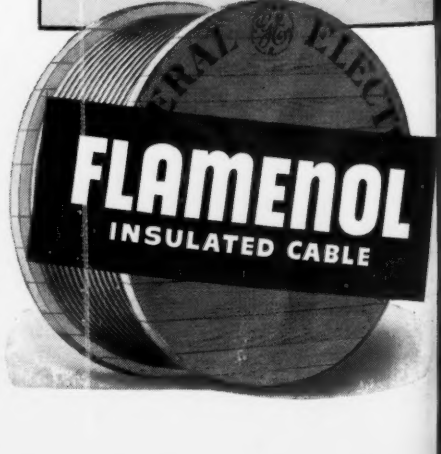
DIELECTRIC STRENGTH

720 volts per mil, retained through severe operating conditions.

In addition to these *time-proved* operating advantages, Flamenol cable is easy and economical to install and maintain. That's why millions of feet of this long-lived cable are used for power and lighting circuits in the chemical, food, textile, printing, oil, mining, steel, automotive, railroad, and other industries. For detailed information on uses, constructions, sizes, etc., write for Leaflet GEA-2733D. *General Electric Company, Schenectady, N. Y.*

7 Extras That Insure EASY INSTALLATION, ECONOMICAL MAINTENANCE

1. SMALL DIAMETER saves space, facilitates wiring.
2. SMOOTH SURFACE assures easy pulling.
3. FREE STRIPPING speeds splicing, avoids nicking conductors.
4. DIFFERENT COLORS simplify circuit tracing.
5. VARIOUS CONSTRUCTIONS to suit special applications.
6. SELF-PROTECTING finish eliminates need for conduit.
7. RETAINS ATTRACTIVENESS makes re-painting unnecessary.



GENERAL ELECTRIC

502-45-1200

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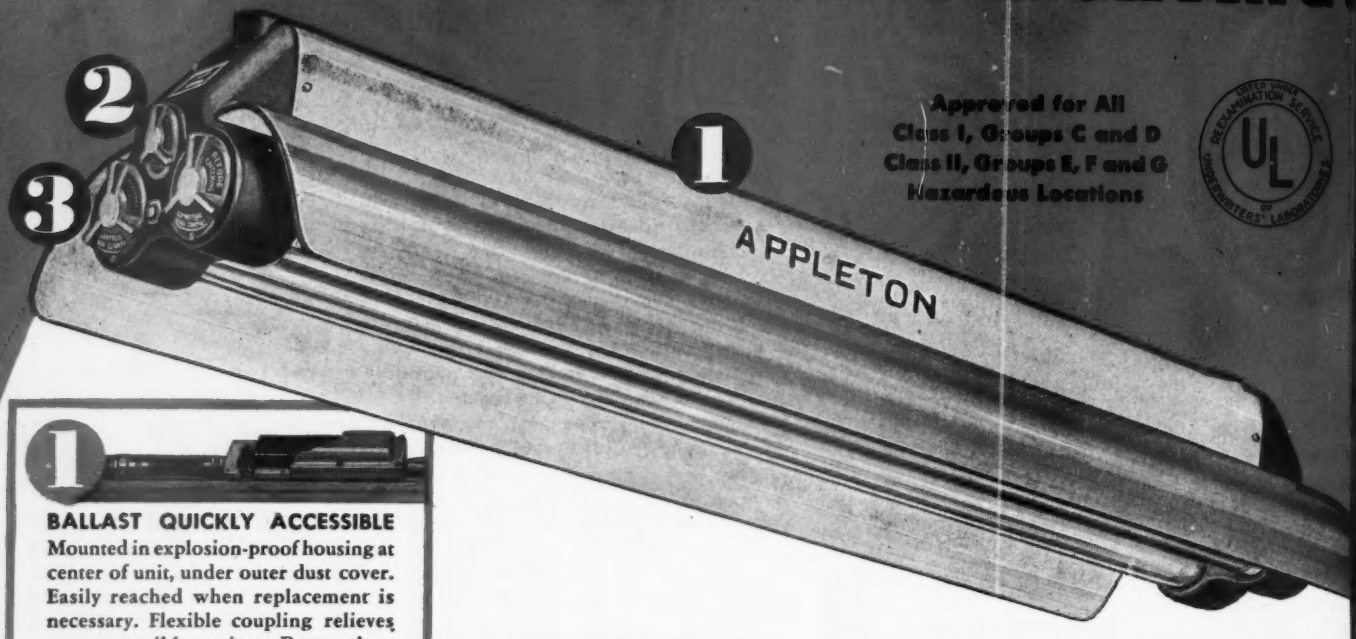
Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

EXCLUSIVE APPLETON DEVELOPMENT

FIRST and ONLY

Explosion-Proof

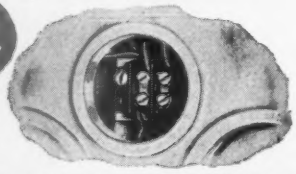
FLUORESCENT LIGHTING



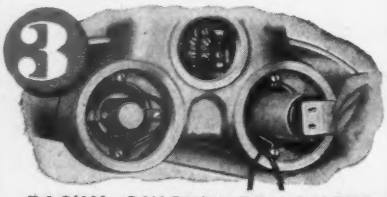
Approved for All
Class I, Groups C and D
Class II, Groups E, F and G
Hazardous Locations

UL

BALLAST QUICKLY ACCESSIBLE
Mounted in explosion-proof housing at center of unit, under outer dust cover. Easily reached when replacement is necessary. Flexible coupling relieves any possible strain on Pyrex tubes.



SAFE, EASY LINE CONNECTIONS
Upper explosion-proof screw cover removed. Connecting block simplifies installation. No other connections are made on the job.



EASILY, QUICKLY RE-LAMPED
Lower screw covers removed. Left shows easily accessible starter, which can be replaced without removing lamp. Right shows lamp supported by wire cradle in tightly sealed explosion-proof Pyrex tube. Cradle seats lamp easily at far end. Special tool furnished for engaging electrodes in handling lamps.

First to offer the advantages of fluorescent lighting in hazardous locations, the Appleton Explosion-Proof Fluorescent Lighting Fixture, announced one year ago, scored an immediate success!

In locations as far away as Hawaii—oil refineries, chemical plants, powder mills, lacquering departments, grain elevators, and other establishments where volatile liquids, flammable gases and combustible dusts are present—these highly efficient, well-balanced Appleton units are stepping up production for war.

Easily installed and serviced (see small illustrations at left), Appleton Explosion-Proof Fluorescent Lighting Fixtures are skilfully designed, ruggedly built, to provide a *wide margin of safety.* They are typical of the complete Appleton line of Explosion-Proof Equipment, bracketing every industrial wiring and lighting requirement.

Check the hazardous locations in your community, NOW! You'll find poorly lighted plants that will welcome the news they can now have efficient, modern lighting—with safety!

Sold Through Wholesalers

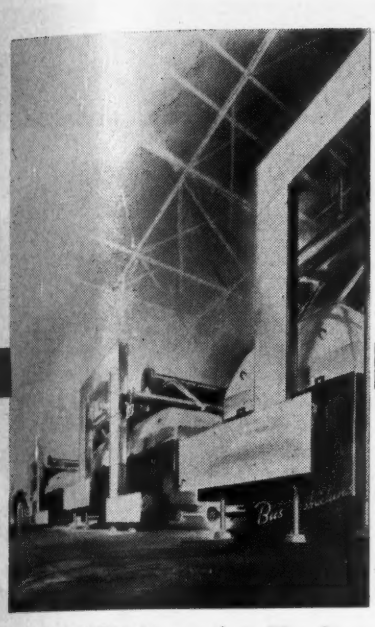
APPLETON ELECTRIC COMPANY
1704 WELLINGTON AVE. • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 175 Luckie Street, N. W. • BIRMINGHAM, 6 N. Twenty-first Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg.

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle

APPLETON ELECTRIC PRODUCTS

APPLETON



OUR COVER this month is "Bus Structures," the fifth in a series of original sketches of electrical equipment in wartime by Artist Stephen Grout.

Electrical Contracting

With which is consolidated The Electrical and Electrical Record . . . Established 1901

Contents for JANUARY, 1944

Departments

McGRAW-HILL PUBLISHING COMPANY, INC.

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A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction and maintenance.

Allis-Chalmers invites Every Reader of this Magazine to tune in next Saturday and every Saturday thereafter

MUSIC — sister to every science and industry furthering Good Living — is Allis-Chalmers' choice of radio entertainment for America.

In the words of Serge Koussevitzky, world-famous conductor of the Boston Symphony itself: "Today American audiences show not only their love and admiration of music, but also a deep understanding of the necessity and importance of musical art in the progress of humanity."

Americans also enjoy the highest standard of living of any people on earth — because they are the mightiest industrial nation on earth.

That is why we respectfully dedicate to *you,* the Men of American Industry, our radio sponsorship of the Boston Symphony.

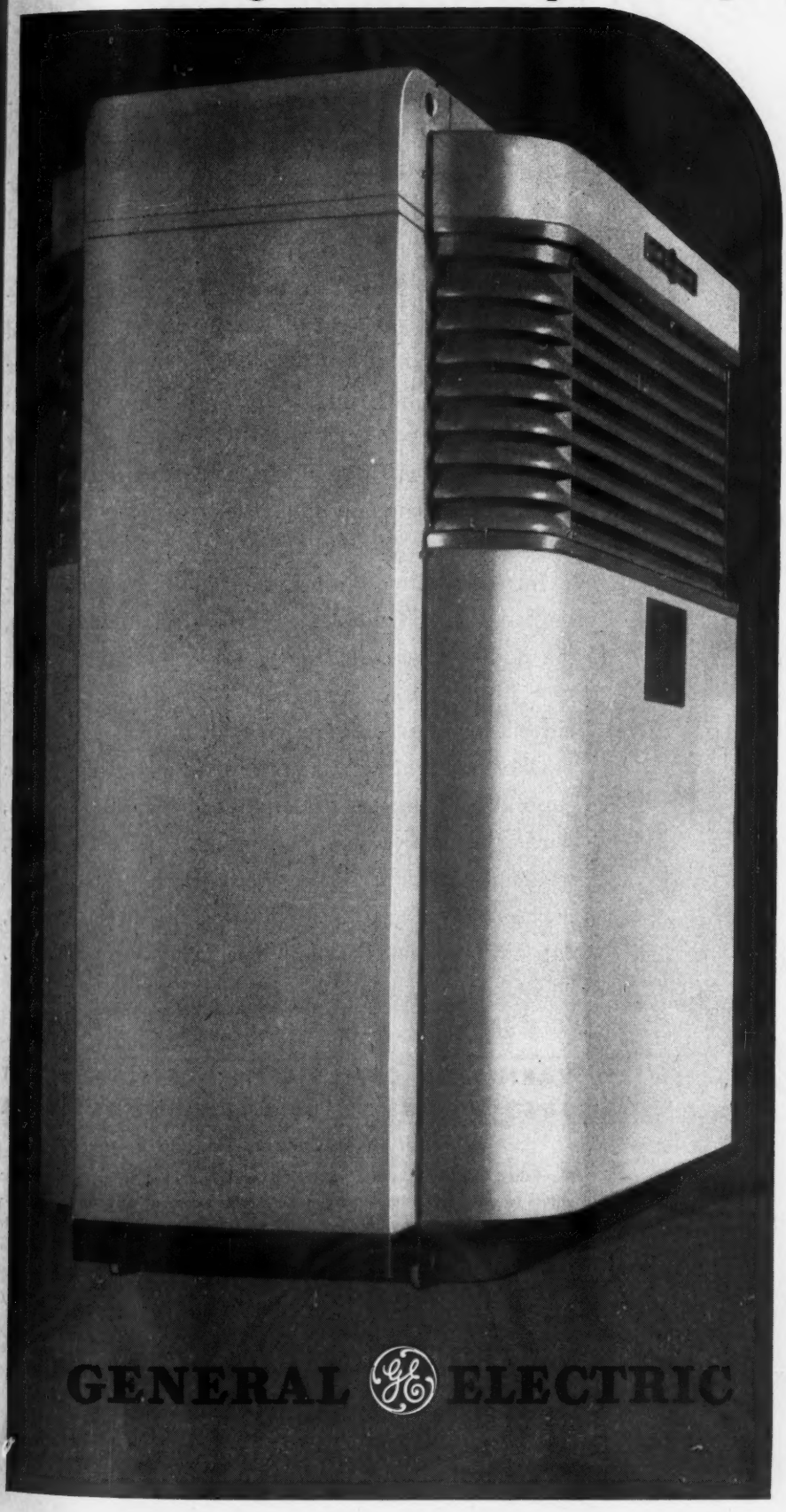
Today over 1600 Allis-Chalmers products are helping America to the earliest possible Victory — *after the war,* the same engineering will mean Good Living, the American Way. ALLIS-CHALMERS, MILWAUKEE, WIS.

A 1686

ALLIS-CHALMERS

REDESIGNED

For greater safety, for speedier installation



THE DRY-TYPE TRANSFORMER of the FUTURE is available NOW

THIS ultramodern distribution transformer is not just a postwar gleam in a designer's eye. *It's an actuality.*

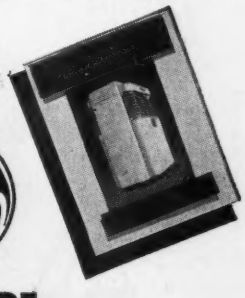
Such transformers are now available for use on 601- to 15,000-volt primary circuits, in ratings from 100 to 500 kva.* We offer them at this time because they afford greater safety and speedier installation than previous dry-type designs—both vitally important today.

For 50 years General Electric has built dry-type transformers. But in designing these streamlined units, we threw tradition to the winds. For indoor installations in industrial plants, their metal-enclosed construction offers a greater degree of safety than the former, open-screened design. Also, the unique housing provides the advantages of enclosed terminals, so arranged as to permit speedy installation.

There are undoubtedly many questions that you'd like to ask about their construction features—features that make for ready accessibility of all parts, excellent ventilation, ease of installation, and safety. You'll find all these questions answered in our new bulletin. Ask for a copy. *General Electric Co., Schenectady, N. Y.*

***G-E dry-type transformers are also available in certain sizes larger than 500 kva.*

Bulletin GEA-37148



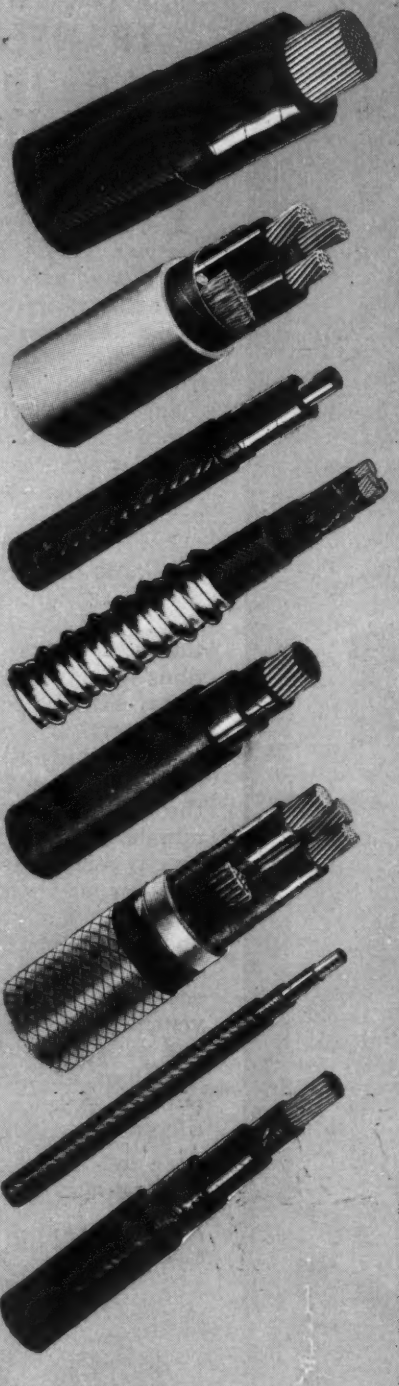
DRY-TYPE TRANSFORMERS

402-64-5100

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds

VARNISHED CAMBRIC INSULATION

is one answer to the rubber shortage



This booklet—OK-1013A—can help solve your wiring problems.

A recent WPB ruling has forbidden the use of natural rubber in the manufacture of electrical wire and cables for most commercial purposes. To help satisfy your wiring needs, why not consider the use of Varnished Cambric insulated cables?

Okonite Varnished Cambric cables are *stable, long-lived* and *easy to handle.* Resistant to heat, oil and ozone, these cables can be used in power circuits for either high or low voltages—for switchboard and control wire—for generator or motor leads—and for many other applications. Okonite V. C. wires and cables are made in either single or multi-conductor construction for all voltages up to 28,000 volts.

Insulated with oil-impregnated cloth, V. C. cables require only a minimum of critical materials. In addition, the higher permissible operating temperature of this type insulation conserves copper by allowing heavier current loadings for a given conductor size.

Okonite Varnished Cambric wires and cables can be supplied in a variety of suitable coverings—lead sheath, wire or metallic tape armor, synthetic jacket, asbestos, or flame-retardant cotton braid. Bulletin OK-1013A contains 36 pages of information on their selection, capacity and installation. Write today for your copy. The Okonite Company . . . Passaic, New Jersey.

VARNISHED CAMBRIC INSULATION IS NOT JUST ANOTHER WARTIME SUBSTITUTE

— yet it saves Copper, Tin and Rubber

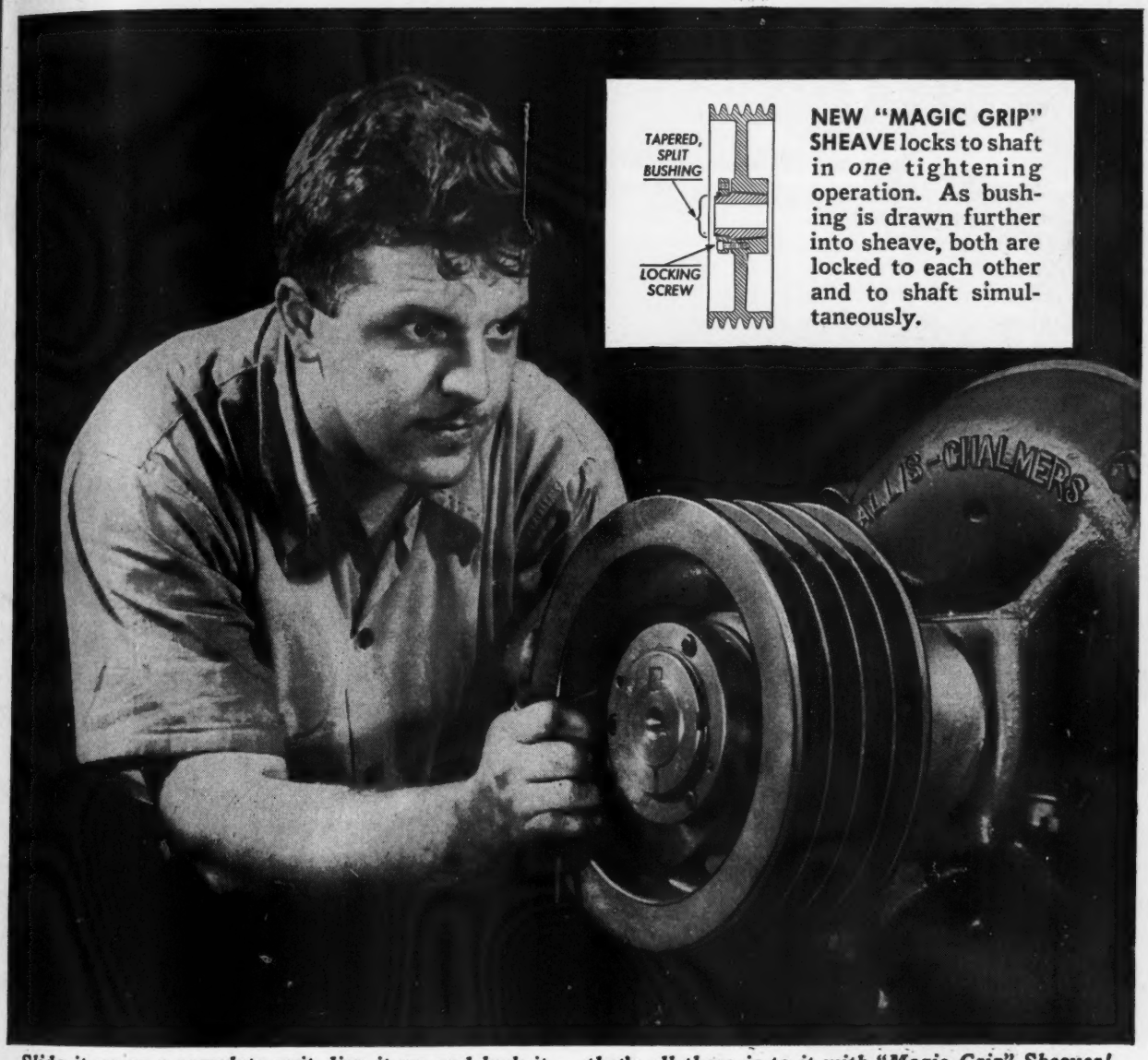
Varnished Cambric insulated wires and cables were not developed as a substitute to meet a wartime emergency. Okonite has been a leading manufacturer of a complete line of Varnished Cambric wires and cables since 1912. For over 30 years V. C. cables have proved to be exceptionally reliable and long-lived.

OKONITE

INSULATED WIRES AND CABLES

3417

PRODUCT OF THE MONTH



Slide it on as a complete unit, line it up, and lock it — that's all there is to it with "Magic Grip" Sheaves!

MILWAUKEE, WIS.—Allis-Chalmers announces the new "Magic Grip" Sheave . . . designed to save man-hours and money by going on or off faster than any other sheave on the market. New "Magic Grip" Sheave fits undersize or oversize shafts, centers perfectly, runs smoothly. Send for Bulletin B-6310.

A 1679

WE WORK FOR VICTORY · WE PLAN FOR PEACE

ALLIS-CHALMERS · MILWAUKEE · WISCONSIN

Protection

ARMY NAVY

SANGAMO TIME SWITCHES

• There are types to meet every protective lighting control need. The complete line includes Astronomic Dial, Synchronous Carry-Over, and Outdoor Time Switches. Form VSW2 Astronomic Dial Time Switch is shown above. Current interruptions up to 10 hours will not stop it nor affect its "on" and "off" settings.

Correct "on and off" times for all floodlighting through AUTOMATIC CONTROL

The sale of floodlighting should not stop there — in fact, it hasn't in thousands of cases. Contractors find that buyers of floodlighting want the assurance of complete protection — and they have the answer for these customers in SANGAMO TIME SWITCHES — devices that assure no errors in "on" and "off" time — therefore, keeping floodlighting effective and on the job for the prescribed times. Where there is a need for floodlighting there is a sale for Automatic Control.

Write for catalog that describes all types — tells about ease of installation, range of application, and dependable construction.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

PORCELAIN

too, BECAME A WEAPON OF WAR

PORCELAIN PROTECTED WIRING SYSTEMS

1. It released steel and other critical metals for fighting equipment
2. It made possible a continuance of industrial, commercial, and residential wiring and was a natural for use in essential war construction
3. It enabled all this wiring on the home front to be done quickly, adequately, and economically

PORCELAIN, with the advent of war, had an immediate call to greater than ever action because of its value in releasing steel and other critical metal for fighting equipment.

PORCELAIN, with a record of years of wiring application back of it, long ago proved the advantages of non-metallic wiring. It was but natural therefore, for the industry to carry-on with Porcelain Protected Wiring Systems—as essential war construction had to be done and critical metals had to go to the fighting front.

PORCELAIN PROTECTED WIRING SYSTEMS continue to be the dependable, low cost, easy to install wiring method. So, today, as you use it and conserve critically needed metals, think of it as the modern, approved, safe method for peace time—when conditions should call for much new wiring and you'll want to do those jobs—the simplest way—the most profitable way—and the way that assures permanence.

For details, write to the companies listed below.

★ **ILLINOIS ELECTRIC PORCELAIN CO.** *Macomb, Ill.*

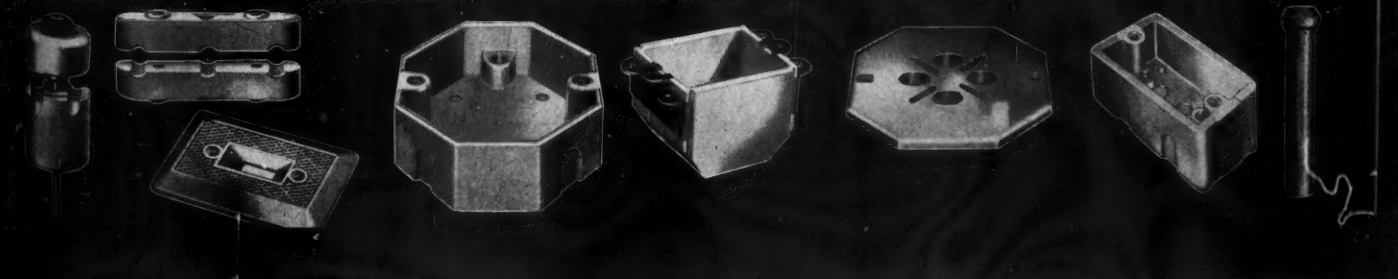
★ **PORCELAIN PRODUCTS, INCORPORATED** *Findlay, Ohio*

★ **SPECIALTY PORCELAIN WORKS** *East Liverpool, Ohio*

★ **SUPERIOR PORCELAIN COMPANY** *Parkersburg, W. Va.*

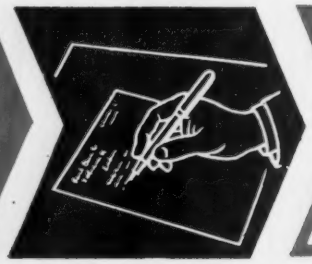
★ **UNIVERSAL CLAY PRODUCTS COMPANY** *Sandusky, Ohio*

MODERN PORCELAIN PROTECTED WIRING SYSTEMS

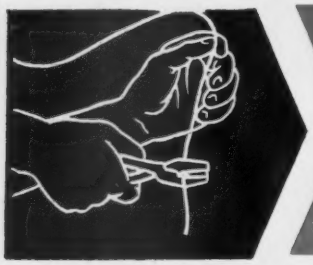


You Save[1] and Save[2] and Save[3]

1 SAVE ORDERING TIME



Instead of buying two separately mounted devices—a motor-circuit switch and a magnetic starter—you buy one factory-co-ordinated unit that controls and protects your motor. Simply specify the motor rating and indicate the type of motor-circuit switch you want—and we'll send you the control you need.

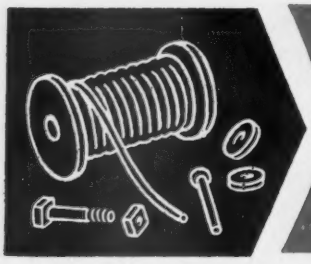


2 SAVE INSTALLATION TIME

Users report a 50 per-cent reduction in mounting time, 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You mount one device—not two. You connect only nine terminals—not fifteen. You get your motors into operation quicker.

3 SAVE MAN POWER

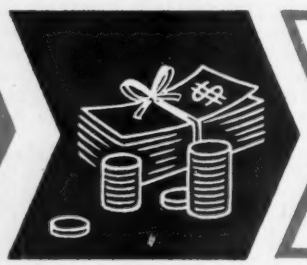
By eliminating one complete mounting job on every installation, you save valuable man power. And because the cover cannot be opened while there is power on the starter, your men have more protection against accidental injury.



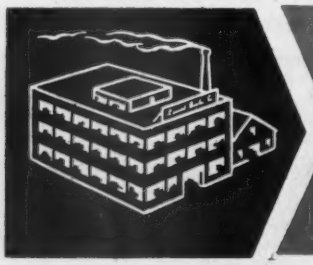
4 SAVE CRITICAL MATERIALS

By buying both the motor-circuit switch and the magnetic starter as one compact unit, you save copper wire, steel conduit, and fittings that are necessary for installing two separately mounted devices—plus the saving gained by using only one steel enclosure instead of two.

5 SAVE MONEY



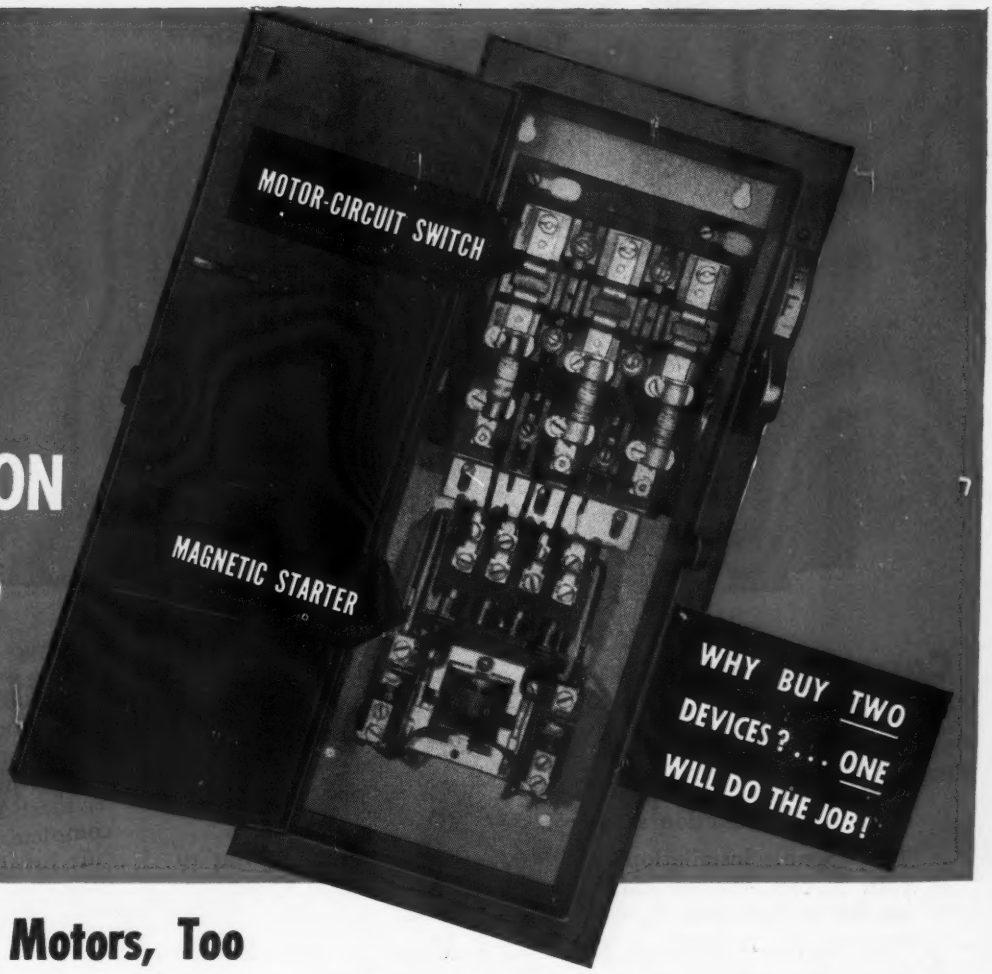
Combination starters cost slightly more than two separately mounted devices, but this difference is more than made up by the savings in wire, conduit, fittings, and installation labor costs. This statement is based on the actual experience of users.



6 SAVE PLANT SPACE

Combination starters take up less mounting space than separately mounted safety switches and starters. Because of this you can mount them in small, unused places near the operators.

and Save[4] and Save[5] and Save[6]...



COMBINATION STARTERS

. . and Save Your Motors, Too

With G-E combination starters, you're sure that the motor-circuit switch or breaker has the proper rating and interrupting capacity for the magnetic starter with which it is used. The fuses or breaker are coordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

It's the simple, logical way to get control and protection for your motors—in one compact, easy-to-install unit. Why buy two devices, when this one will do the job?

NAME YOUR HAZARD

G-E combinations come in enclosures to meet any operating condition: dust-tight, watertight, oil-immersed, general-purpose, or for hazardous locations. Available for motors from 1 to 1000 horsepower.

GENERAL ELECTRIC

Next time you order motor control, save seven ways by specifying General Electric combination starters.
General Electric Company, Schenectady, N. Y.

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

General Electric Company, Section D676–129
Schenectady, N. Y.

Please send me the bulletins checked below:

- GEA-3715—Combination starters: general-purpose, watertight, and dust-tight
- GEA-3660–2300-volt combination starters
- GEA-3804—Combination starters for hazardous locations
- GEA-3541—Oil-immersed starters

Name.....

Company.....

Address.....

City.....State.....

8929

IS YOUR POWER SYSTEM OVERLOADED?

Do You Want More Capacity . . . Quickly . . . Inexpensively?

CAPACITOR PLUG mount on BUStribution DUCT (h dle on plug cover perm operation from floor).

Capacitor Plugs help in these ways!

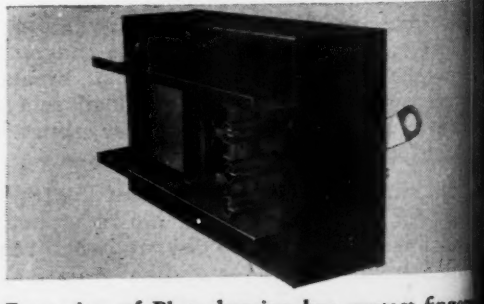
1. Inserted in any of the plug-in openings of your BUStribution DUCT, BullDog Capacitor Plugs increase the capacity of your electrical system by reducing the reactive KVA, thus ensuring lower operating temperatures and preventing needless fuse blows and production shutdowns.
2. They permit installation of Capacitors at the nearest point to your motors. As the load center shifts, the plug-in Capacitors can be shifted with it.
3. They represent a *decentralized,* and consequently more flexible, arrangement of Capacitors. Even if a unit should fail, the power factor correction of the entire system would not be affected, as it would with *centralized* banks of Capacitors.
4. They make possible the strategic location of Capacitors at the points in the system where poor power factor occurs, and this improves conditions for the rest of the equipment all the way back from the motors, through the bus duct, through the secondary switchboard, to the transformers.
5. Capacitor Plugs not only improve your power factor, but save valuable space and critical materials such as copper and steel . . . to say nothing of man-hours and production saved because of fewer blown fuses and greater operating efficiency.

BullDog field engineers are as close as your telephone for complete details . . . or write us direct.

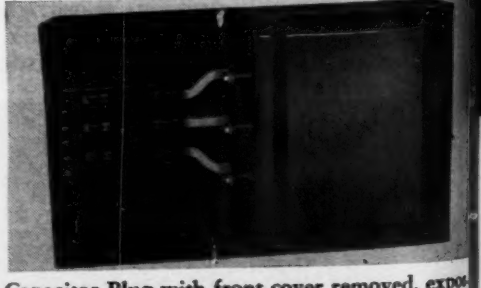
FOR A BRIGHT FUTURE BUY MORE WAR BONDS

New BullDog Capacitor Plug

You don't have to worry about space or supporting means for these Capacitors. Just plug them into the BUStribution Duct. It's as quick and easy as that! Rated from 1 to 15 KVA, complete with fusible switch or circuit breaker in one compact handy Plug for 230V or 460V 60 cycle.



Rear view of Plug showing bus contact finger for plugging into openings along bus duct runs



Capacitor Plug with front cover removed, expos ing fusible disconnect switch and capacitor unit

BULLDOG

ELECTRIC PRODUCTS CO.

Box 177, R. Pk. Annex, Detroit 32, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

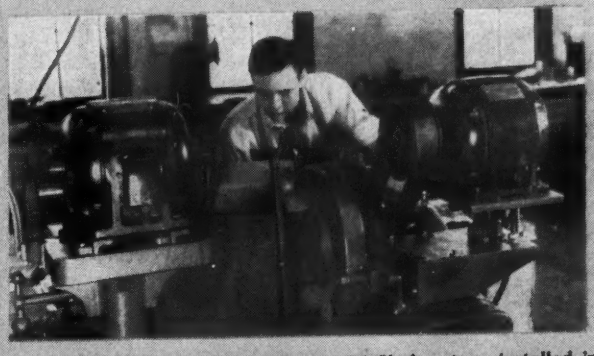
Field Engineering Offices in All Principal Cities

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Circuit Breakers and BUStribution SYSTEMS.

SHORTS STYMIED

Voltage surges which accompany switching and frequent starting and stopping of motors impose high dielectric stresses on the coil insulation, and can cause harmful short circuits. Yet this is an unavoidable condition of service for many motors.

The grinder shown here, for example, starts and stops every time a finished part is removed and a new part inserted. But the two Tri-Clad motors that drive it have been built to withstand safely the voltage surges ordinarily encountered in this type of service. Their ability to "stymie" shorts was proved by *the new General Electric test* described below.



External grinder, equipped with two Tri-Clad motors, installed in the milk-machinery manufacturing plant of the Rite-Way Products Company, Chicago, Ill.

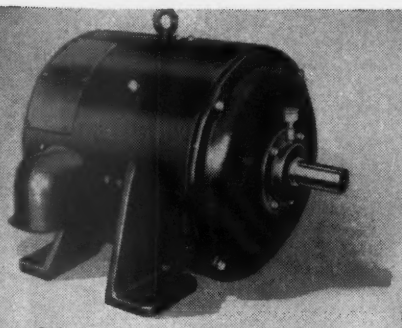
New high-potential, electronic surge-tester verifies strength of TRI/CLAD motor windings

This electronic test of insulation makes a "cardiogram" of every Tri-Clad motor winding, ferreting out weaknesses that might lead to shorts caused by voltage surges in service. It tests each turn, coil, and phase group of the windings for adequate insulation strength to withstand the "steep front" high-voltage surges of actual service. First developed and applied by G.E., it's one of the production tests which all Tri-Clad motors must pass as they come off our production lines. – *General Electric Company, Schenectady, N. Y.*

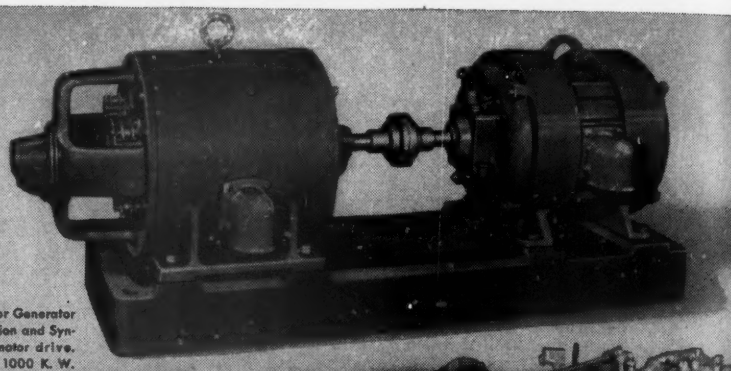
GENERAL ELECTRIC

TRI/CLAD MOTORS

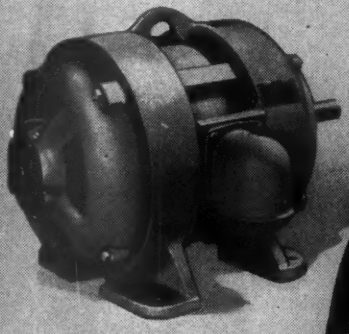
Each week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.



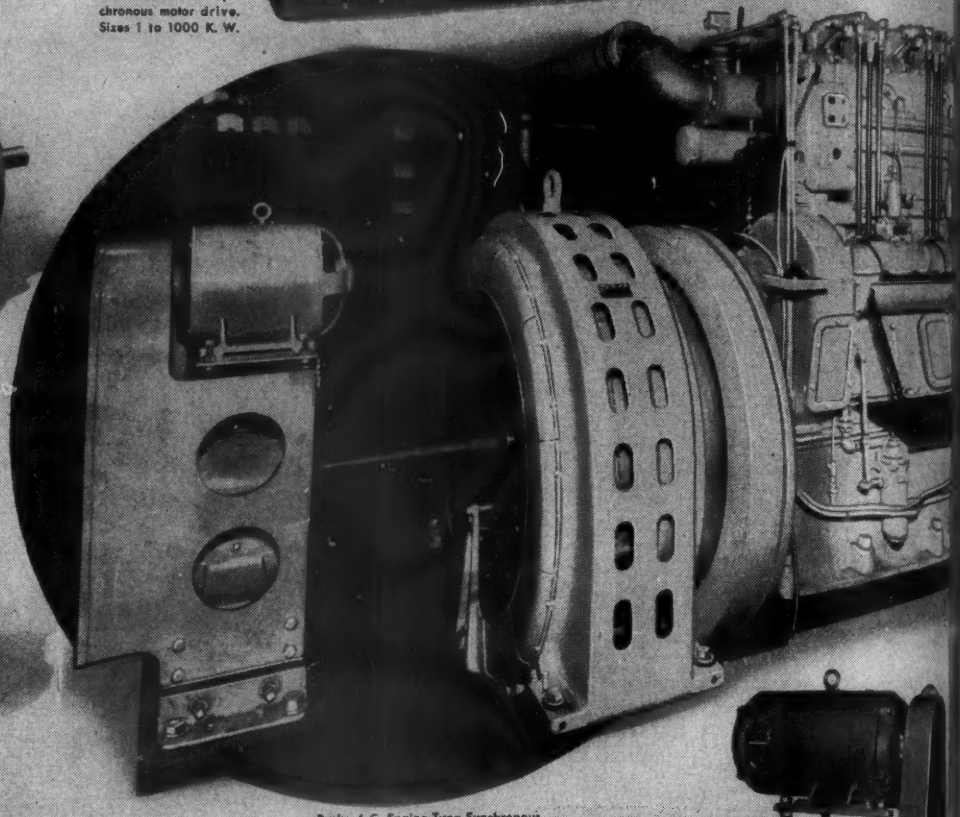
Burke Bracket Type D.C. Motors and Generators. Sizes 1 to 1000 K.W.



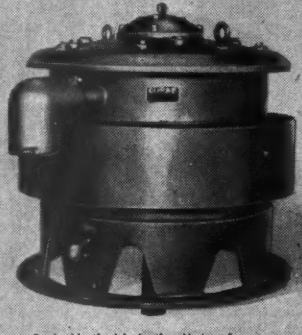
Burke Motor Generator Sets Induction and Synchronous motor drive. Sizes 1 to 1000 K. W.



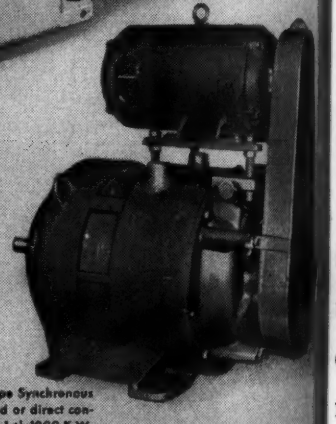
Burke Induction Motors, ball or sleeve bearing. Sizes 1 to 1500 H. P.



Burke A.C. Engine Type Synchronous Generators. Sizes 25 to 1000 K. W.



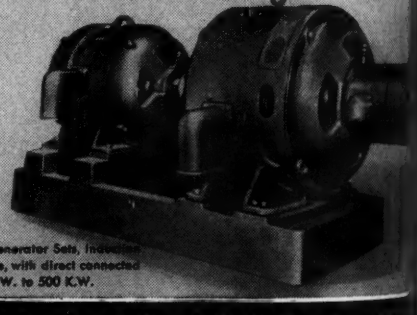
Burke Vertical Induction Motors for pump drive. Sizes 1 to 1500 H. P.



Burke A.C. Bracket Type Synchronous Generators with belted or direct connected exciters. Sizes 1 to 1000 K.W.

Designed for the Job

BURKE offers to industry a highly specialized experience in applying its wide range of standardized motors and generators to meet specific requirements from one horsepower up. Wherever the maximum in capacity and overload are demanded, it will pay you to get Burke's recommendation, for Burke stresses quality and workmanship in every detail. You can depend on a Burke for more than its rating.



Burke High Cycle Motor Generator Sets, Induction or Synchronous motor drive, with direct connected exciters. Sizes 5 K.W. to 500 K.W.

MOTORS 1 TO 1500 H. P. • GENERATORS 1 TO 1000 K. W.

BURKE A.C. & D.C. Motors & Generators

BURKE ELECTRIC COMPANY, ERIE, PENNSYLVANIA • *Since 1891*

Reconversion *and* Contract Termination

AMERICAN industry is dedicated to an all-out effort to achieve victory, and its good faith in this direction is amply demonstrated by the results.

American industry also is dedicated to making democracy work effectively after the victory. And it is toward this objective that industry must prepare itself to guide the processes of demobilization and reconversion in order to minimize the dislocations and chaos which too easily can result from so tremendous a task.

We exercised foresight from the very beginning of the war mobilization program. Let us now exercise foresight in the approaching changeover from a wartime to a peacetime economy.

The first step in converting American industry from military to civilian production is the termination of contracts between the government procurement agencies and the producers. There are now in force war contracts amounting to tens upon tens of billions of dollars. As the demand for weapons of war decreases, the Armed Services will undertake to cancel contracts. With the emphasis shifting from weapons of one category to weapons of another category, many billion dollars worth of contracts already have been terminated. It is hoped that the experience now being gained in this work will provide the basis for effective and sound procedures when an avalanche of cancellations comes later.

Many complex problems involved in the termination of contracts will materially influence the success of the entire reconversion program. Once war demands fall off sufficiently to permit the renewal of civilian production, we will have to act with great speed if we are to avoid large-scale unemployment. Prompt financial settlements of contracts and the rapid clearance of plants are of immediate and great significance. In many cases the removal of equipment and raw materials will be more important than money payments. The allocation of raw material for civilian production will be of paramount importance.

Government agencies obviously must exercise great care in spending the people's money and in protecting the interest of the public against excessive payments. Unjust enrichment at the expense of the people will not be condoned nor will it reflect favorably upon management to present inflated claims. But long-delayed negotiations, which will retard the initiation of civilian production, likewise must be avoided.

The contracting agencies and the manufacturers both know that the greatest losses in the reconversion period will result from delays in getting peacetime production under way. The

greatest potential wastes lie in unemployment and in idle plants. The magnitude of such losses to the public can be far greater than the money spent in liberal settlements; to the manufacturer, these losses can represent vastly more than the extra funds that might result from interminable litigation. Policies must be firmly established *now* whereby the manufacturers, including subcontractors and suppliers, will receive substantial settlements immediately in order that ample funds be available for reconverting plants and accumulating necessary inventories of peacetime goods. Nor must we overlook the fact that the uncertainty of long drawn-out disputes will have a stifling effect on enterprise and that final settlements, therefore, should be made as promptly as possible.

Plants that are equipped largely with special wartime tools and machines and that are fully stocked with materials, components, and finished military products will not be able to undertake any substantial degree of conversion until this machinery and this inventory are removed. Advance arrangements are essential for the prompt clearance of great numbers of plants the country over. Adequate warehousing facilities must readily be available so that the changeover to civilian production will not be hampered.

As war demands decline, civilian output will be resumed; and while we recognize that the demands for munitions must vary as the strategy of the military leaders is changed, it is hoped that the Armed Services already have or soon will develop schedules of their continued needs under different strategic assumptions. If we know in advance the probable curtailment in war requirements we are in position to estimate the timing and the quantities of raw materials, the number of workers, and the industrial facilities which will be available for peacetime purposes. It will then be possible to integrate the lifting of restrictions on civilian production with the drop in war production.

Needless unemployment and idle plants will prevail if restrictions on the output of civilian goods are removed at a slower rate than available manpower, materials and plants permit. On the other hand, if the controls on civilian production are removed prematurely or too freely, then the production of military requirements will be hampered correspondingly. There will be great clamor and pressure for eliminating all restrictions as soon as any measurable quantity of materials and numbers of workers are freed from war work. It will react adversely on industry as well as on government if these pressures are heeded indiscriminately, thereby retarding the production of munitions for our boys who still will be fighting and dying at the front. The coordination of declining war demands with increasing civilian production probably is the most difficult and at the same time the most important task in our entire reconversion problem. Advance planning and sound judgment are essential.

An order of priority for initiating non-war or civilian production must be prepared beforehand. The schedule of resumption of peacetime production should be governed by the amounts of

materials, manpower and facilities that are available as well as by the relative needs or importance of different products. There will be strong competition for priority among the various kinds of consumer goods, equipment needed for reconversion, producers goods required for expansion and modernization, and export demands. Relative need obviously is the most compelling criterion. But because of the importance of expediting reconversion, earliest consideration is urged for the tools and fixtures and models which will expedite large-scale civilian production when adequate labor and materials are available. In any case, advance schedules will be needed to avoid a makeshift, piecemeal lifting of controls on the basis of who shouts the loudest.

Another difficult problem of the reconversion period will be to keep to a minimum the distortion of inter-industrial and intra-industrial relationships. Many varieties of consumers goods compete for the consumer dollar, and some industries will offer strong resistance if the green light is given first to industries whose products may thereby acquire a time advantage.

Even more difficult will be the matter of competition between companies producing the same products. Some manufacturers may find themselves tied up with continuing war contracts with restrictions on their peacetime products suddenly lifted and their competitors free to take advantage of the situation. The declining need for different kinds of war materiel will vary greatly, and some producers inevitably will be available for peacetime production considerably in advance of some of their competitors.

This raises the question of victory models or nucleus plants to eliminate competitive advantages among producers of identical products pending the time when all are on an equal footing again. Policies controlling this should take into account the degree or the extent of competitive advantage which reconversion might bring, and also upon the time interval during which these advantages will prevail. Such programs necessarily mean increased government control, hence they should be adopted only under the most pressing circumstances.

There is the important question of termination as between large and small plants. Fairness must be exercised, and undue advantage to either group must be avoided in extending opportunities to continue receiving profitable war orders or in getting back into civilian production. The problems of small manufacturers must not be neglected in this period. Likewise, any restraints on new ventures and on more vigorous competition must meticulously be avoided.

There also is the question of communities which have been greatly enlarged and others which actually have been brought into being by the war. It might be advisable to terminate contracts in these areas first in order that the workers might be encouraged to migrate elsewhere while employment prospects are most favorable. Also, if continued production of some armaments is contemplated after the war, it might be well to concentrate this production in communities which otherwise would be stranded.

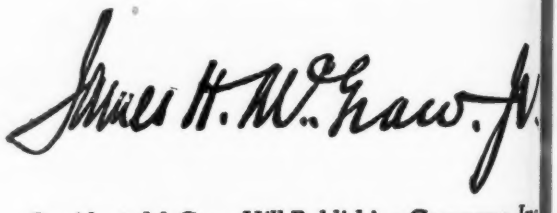
If the process of terminating contracts is to be geared into meeting continued demands for munitions and also expediting reconversion, then the Armed Services must accept broad policy considerations as criteria for cancelling contracts. Procurement officers might be inclined to cancel contracts with all high cost producers first. Or they might be inclined to cancel small producers first so as to reduce the administrative burden. Then again, they might cancel the newer producers of specific products rather than the older, time-tried manufacturers.

These procurement criteria may all be highly desirable and efficient but other important considerations such as those mentioned above must be given proper attention. ***Demobilization cannot be a separate process from reconversion.*** They must be united. The termination of contracts is a demobilization task, but I am confident that the procurement agencies appreciate the importance of this operation in facilitating reconversion and that they will take full cognizance of the policies necessary for giving every assistance to initiating peacetime production.

I have not attempted to raise all the important policy questions in terminating contracts, nor do I propose specific solutions for each major problem. Rather it has been my purpose to indicate the complexities of the task which faces us and to urge that intelligent and sound plans be developed now while there is time. By so doing, we can avoid the dislocations and economic disorder which otherwise might characterize the reconversion period. The better we are prepared the more rapid will be the resumption of ful employment and good business after the wa is won.

This job of changing America's industrial pat tern from war to peace speedily and efficiently is one which will tax the talents and knowledge of the ablest business men of the country. These men can, and I am sure that they will, attack this task with the same energy and determination that characterized their efforts in the period of mobilization for war.

Industry advisory committees were established to cooperate with governmental agencies in the great task of conversion to a full war economy. These committees are the means through which industry has the opportunity to play a major role in the solution of the problems of reconversion. It must assume that responsibility or accept the consequences in the form of enforced government control. Industry must take a renewed interest in these committees and make certain that our best minds and strongest men are available for the challenging job of conversion which we face now. It is a job that must be done well if we are to have a good start on the road to a greater democratic and free enterprise nation.



President, McGraw-Hill Publishing Company, Inc.

this made a hit with me!

AS I opened those covers, I was a little skeptical. But when I saw those sketches and precautions to be taken when designing or installing propeller fans or blowers, I started to sit up and take notice. Here were new ideas and practical information that I *needed* and *could use* on my job!

And then . . . when I came to those dozens of typical installations, in all kinds of buildings—apartments, stores, homes, factories, etc.—well indexed and complete with photos and drawings, I said to myself "Hank, here is a swell work-book. It's going to be right at my elbow from now on!" And that's where it is now!

So I'm passing this tip on to you. If you have anything to do with the layout, installation or operation of ventilating systems . . . get this 88-page "ILG-Book"! It's priced at $1.00, but you can get it *free* if you fill in and attach coupon below to your company letterhead. Or consult your classified directory and phone ILG's nearby Branch Office!

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VITALIZED VENTILATION

AND AIR CONDITIONING

AIR CHANGE . . . NOT JUST AIR MOVEMENT!

ATTACH COUPON TO YOUR LETTERHEAD — MAIL TODAY

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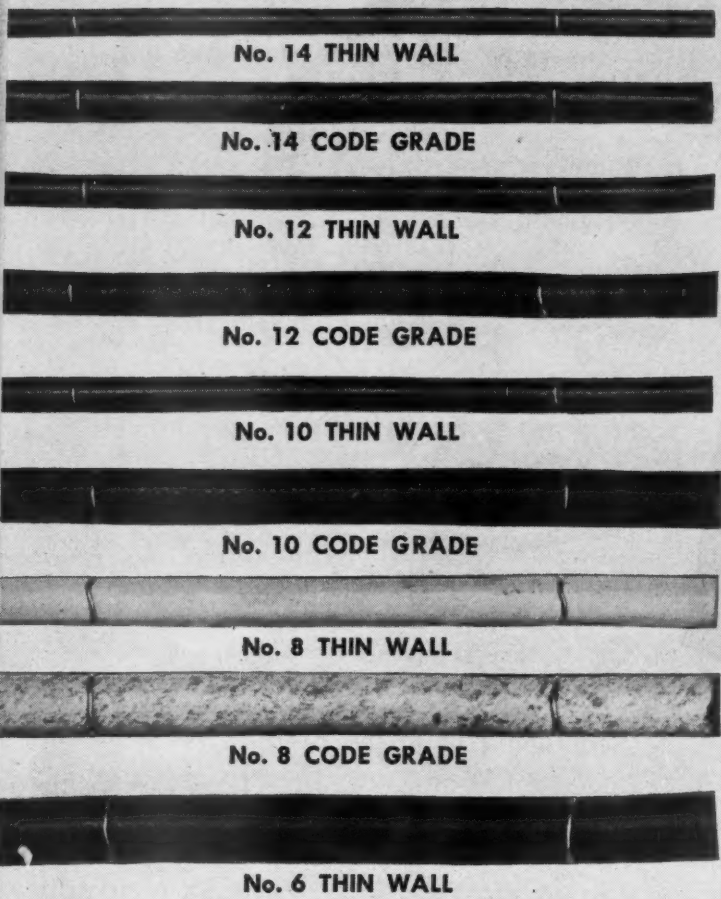
WIRE SIZES USED FOR ELECTRIC POWER IN COMMERCIAL BUILDING



No. 14 THIN WALL

No. 14 CODE GRADE

No. 12 THIN WALL

No. 12 CODE GRADE

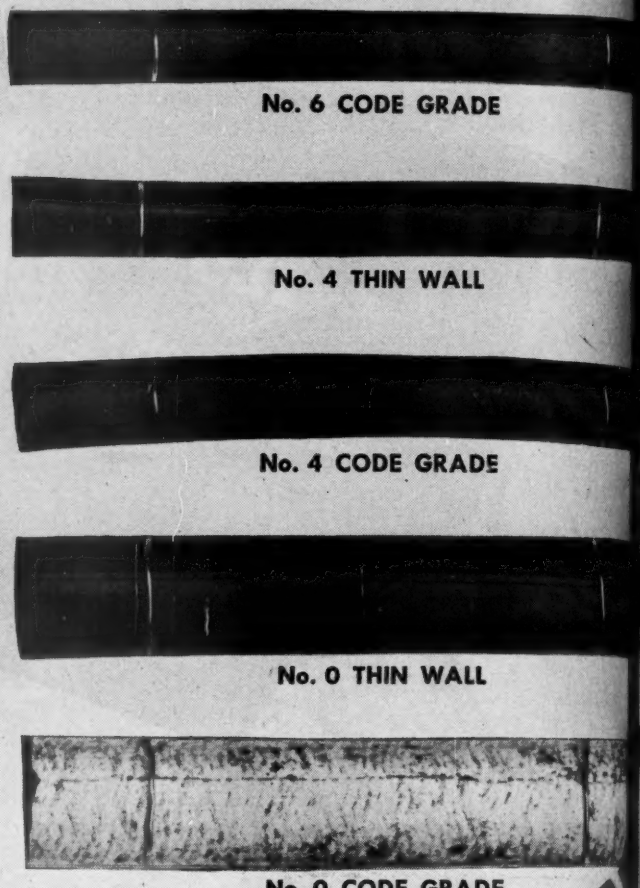
No. 10 THIN WALL

No. 10 CODE GRADE

No. 8 THIN WALL

No. 8 CODE GRADE

No. 6 THIN WALL



No. 6 CODE GRADE

No. 4 THIN WALL

No. 4 CODE GRADE

No. 0 THIN WALL

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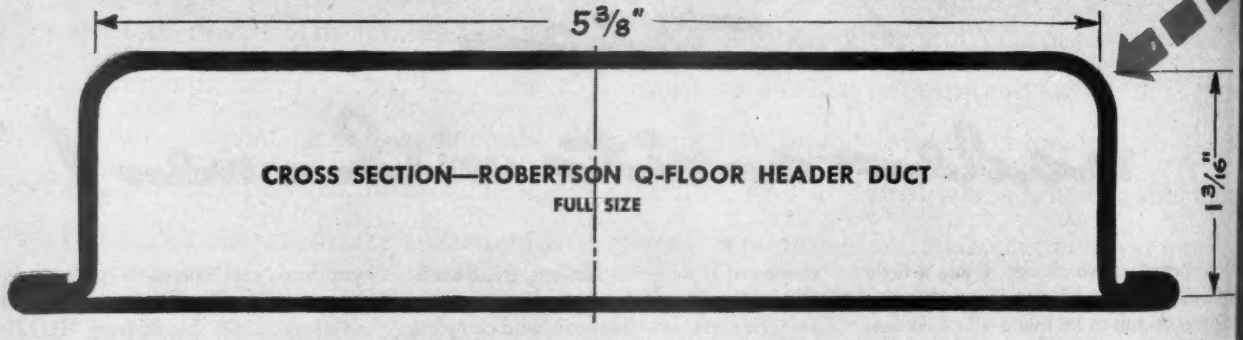
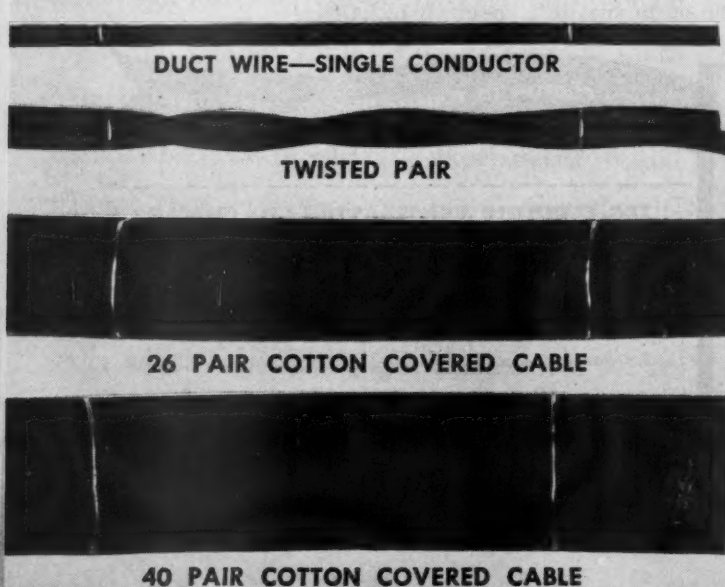


CROSS SECTION—ROBERTSON Q-FLOOR HEADER DUCT
FULL SIZE

WIRE SIZES USED FOR TELEPHONE SERVICE IN COMMERCIAL BUILDING



DUCT WIRE—SINGLE CONDUCTOR

TWISTED PAIR

26 PAIR COTTON COVERED CABLE

40 PAIR COTTON COVERED CABLE

16 PAIR LEAD CABLE

26 PAIR LEAD CABLE

50 PAIR LEAD CABLE

ROBERTSON Q-FLOORS are adaptable

to all types of wiring covered by the National Electrical Code

The *Header Duct* used with Robertson Q-Floor provides 6.38 square inches of cross-sectional duct area . . . affording space for both large cables and twisted pair wires.

The type floor unit shown above provides an internal cross-sectional area of 11.25 square inches. Other types of Q-Floor units provide even greater cross-sectional areas.

Electrical and mechanical isolation of the wiring systems is assured in this *completely available floor* Cells provide wiring raceways on six-inch centers.

H. H. ROBERTSON COMPANY. Farmers Bank Building. Pittsburgh, Pa.

Merchandises ROBERTSON

Q-FLOOR

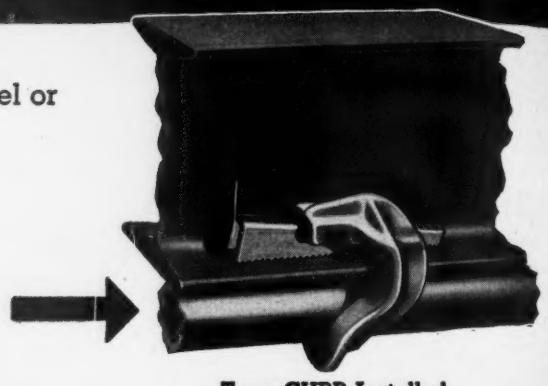
ELECTRICAL FITTINGS

For information about these fittings and how they are used to obtain adequate up-to-date electrical wiring—get in touch with your nearest "G-E" Merchandise Distributor.

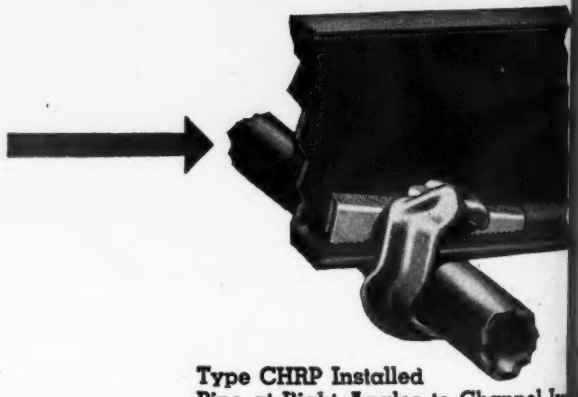
ROBERTSON Q-FLOORS

CROUSE-HINDS
NEW Dual-Purpose
Type CHRP *Wedgtite* Pipe Hangers

● **Hangs pipe either way.** Parallel or at right angles to structural support.



Type CHRP Installed Pipe Parallel With I-beam



Type CHRP Installed Pipe at Right Angles to Channel Iron

● **Simple.** Only 2 parts, a hook and a wedge.

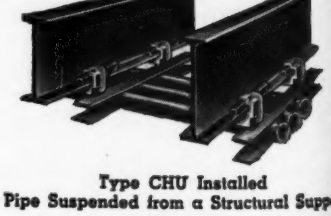
● **Easily installed.** A few blows of a hammer.

● **Malleable iron hook.**

● **Hardened steel saw-tooth wedge** bites into flange, making a tight, vibration-proof grip.

● **Adaptable.** Sizes for ½ to 2-inch pipe. Can be used on any I-beam, channel iron, or other structural shape having a flange ⅛ to 1⅛ inch thick.

Other *Wedgtite* Pipe Hangers



Type CHU Installed Pipe Suspended from a Structural Support

Type CHB for Pipes Parallel or at Any Angle with Structural Support

***Wedgtite* pipe hangers can be used for electrical conduit, water pipes, steam pipes and sprinkler systems.**

Wedgtite Hangers are listed in Conduit Catalog No. 2500, Section 70, Pages 3 and 4. Type CHRP Wedgtite Hangers replace both type CHR and type CHP.

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY
SYRACUSE, N. Y., U.S.A.

Offices: Birmingham Boston Chicago Cincinnati Cleveland Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee Minneapolis New York Philadelphia Pittsburgh San Francisco Seattle St. Louis Washington

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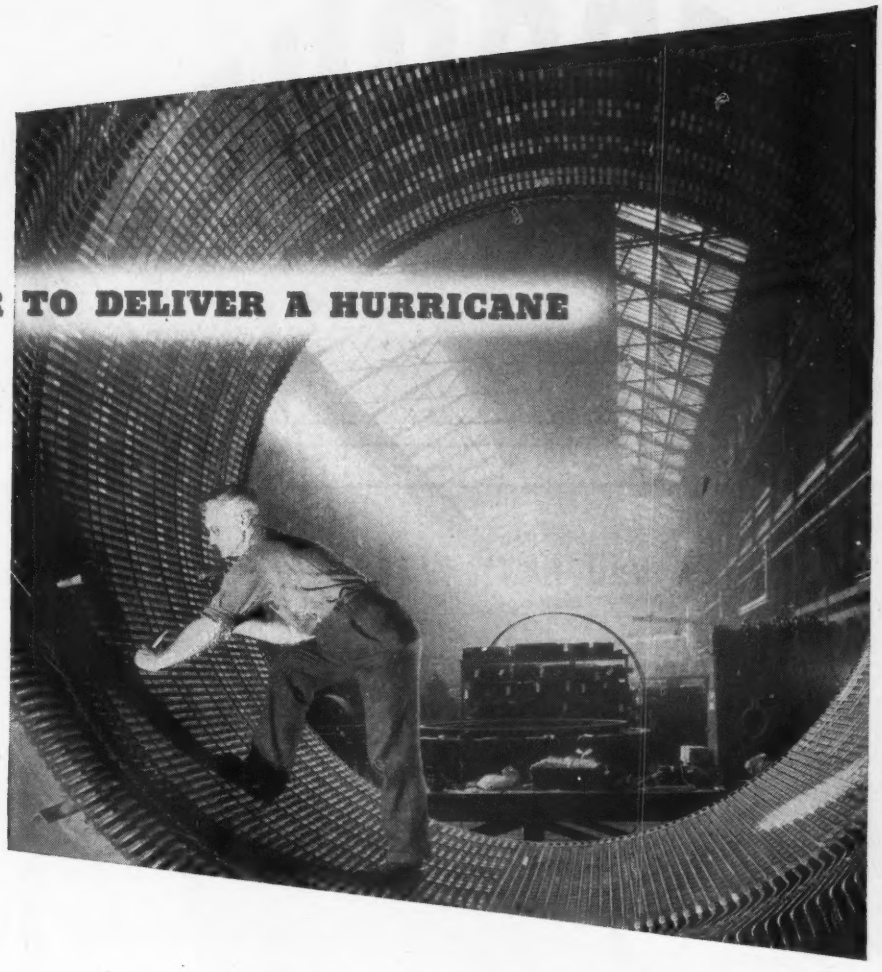
CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

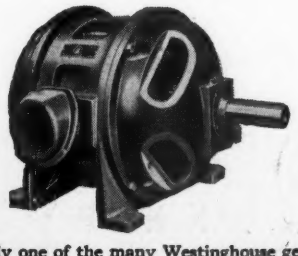
BUILDING A MOTOR TO DELIVER A HURRICANE



Driving a 400 mile-an-hour super-hurricane through a plane-testing tunnel takes plenty of horsepower . . . more than anybody had ever packed into a wound-rotor induction motor before. To do it, Westinghouse designed and built the world's largest. Its 40,000 horsepower spins two 16-blade fans standing nearly 40 feet high—weighing 197 tons. The motor itself weighs 125 tons, stands 15 feet high and you could drive a small truck through the stator you see above. Cooling it takes 85,000 cubic feet of air per minute.

This is just another example of Westinghouse ability to build motors—motors designed to do specific jobs. It's the kind of engineering skill back of every Westinghouse motor you buy—special or standard.

For war work or postwar reconversion, take full advantage of this ready-to-use experience. You'll solve your drive problem quicker and know the motor will fit the job—whether it is a fractional or 40,000 horsepower. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. J-21294



This is only one of the many Westinghouse general purpose motors available in standard and special enclosures. Features include choice of sealed sleeve or ball bearings; Tuffernell insulation; Balanced rotor; rigid one-piece frame; die-cast rotor; radio-frequency tested insulation.

Westinghouse Motors

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

PANCAKE WIREMOLD

QUICK and EASY WAY to make FLOOR SPACE more productive!

● Every plant, every office building, schools, laboratories, hospitals, constantly face problems of efficiently utilizing available floor space and frequent relocation of working units. Pancake Wiremold, the safe, simple OVERFLOOR Wiring System quickly takes care of required wiring connections . . . to desks, work-benches, appliances and machines . . . for work lights, telephone, control or signal systems. Uses minimum critical materials. Fast, easy installation . . . readily extended . . . connects to existing panels or wall outlets.

PHONE, LIGHT OR POWER OUTLETS . .

A few well designed standard fittings meet every requirement. Dangerous long extensions are eliminated, maintenance is reduced to a minimum.

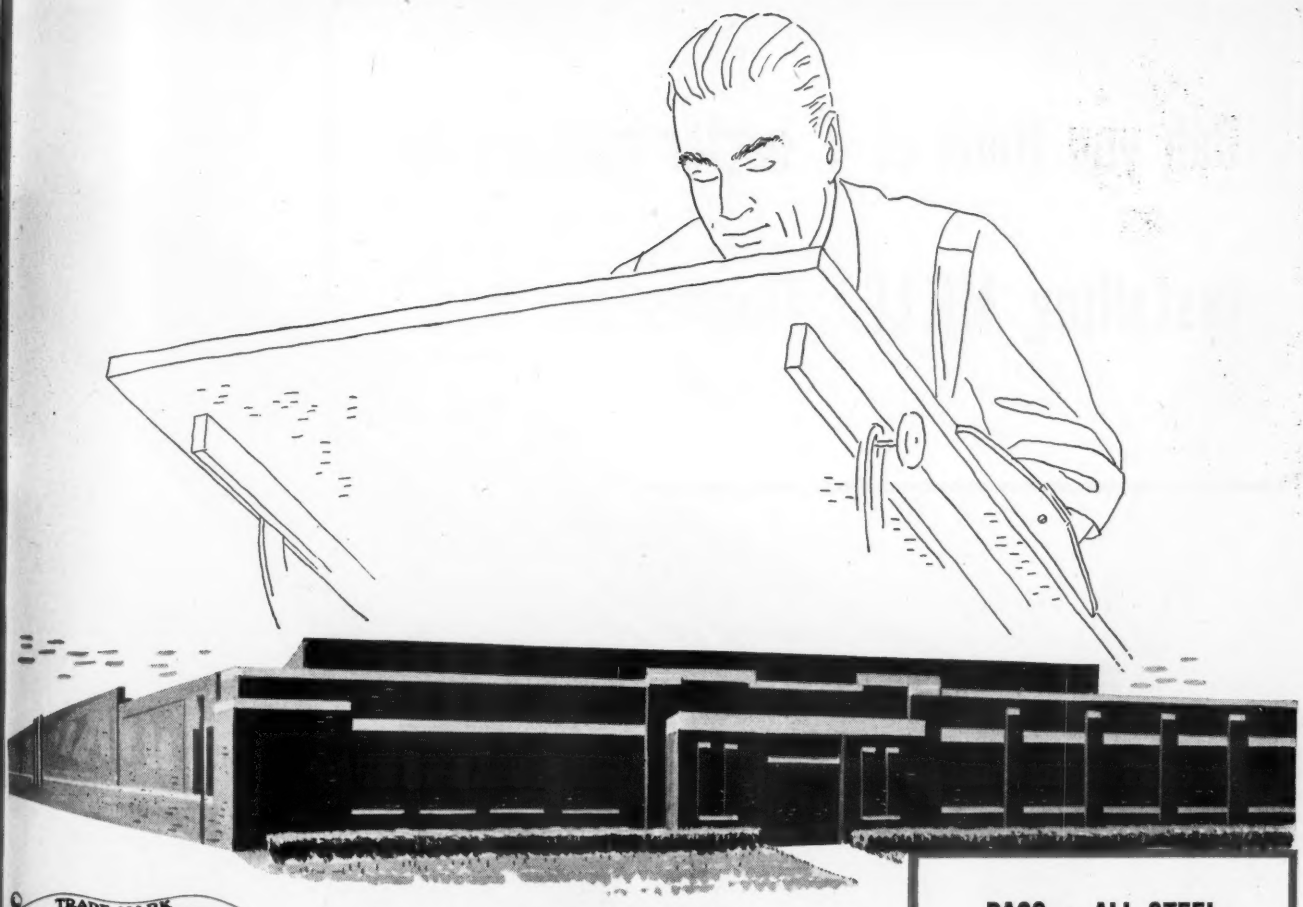
INSTALLED WITHOUT DISTURBING WORKERS

Pancake, like other Wiremold Systems requires no channeling of floors or walls, can be installed without special tools, entails no pipe threading or waste. Slip joint connections are quickly made yet permanent, safe. Conforms to Federal Specification W-R-32; Listed by Underwriters' Laboratories.

Write for your copy of the Wiremold Catalog and Wiring Guide detailing this and other Wiremold aids to greater lighting and electrical efficiency.

The Wiremold Company, Hartford 10, Conn.

WIREMOLD CAN HELP YOU PRODUCE FOR WAR . . . AND PLAN FOR PEACE



TRADE MARK
RACO
REG. U.S. PAT. OFFICE

WILL BE READY TO MEET YOUR REQUIREMENTS OF "TOMORROW"

IMPORTANT war contracts are, of course, demanding Raco's attention today — but in addition, extensive postwar plans are being formulated at the Raco • All-Steel factory.

In our current research, postwar markets are being studied — every effort is being made to simplify Raco products. Through both war contracts and postwar plans, Raco • A-S-E Engineers are keeping in step with wiring trends. You are assured that Raco products "tomorrow" will measure up in every way to Raco • All-Steel's reputation for quality — that you will be able to meet the huge demands which postwar electrical developments will bring about.

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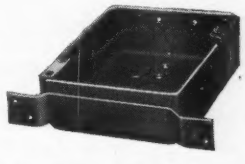
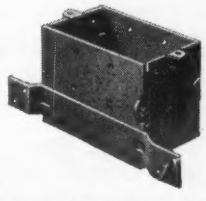
ALL-STEEL-EQUIP COMPANY, INC.

601 Griffith Avenue, Aurora, Ill.

RACO • ALL-STEEL ELECTRICAL PRODUCTS



CO½-O Square Outlet Box — a tested veteran now serving extensively in the war effort. Also used widely in the expansion of the nation's industrial business.



RMO Switch Box "Side Mount" type — adapted for newer types of building construction.

RACO • ALL-STEEL • PRODUCTS

SWITCH BOXES • OUTLET BOXES • CONDUIT FITTINGS • CABINETS

Can you think of 7 better reasons for installing MILLER Fluorescent now?

Here are provable facts—facts that have caused war industry to insist upon MILLER 50 & 100 FOOT CANDLER Continuous Fluorescent Lighting Systems . . .

1 NEW, IMPROVED DESIGN of the Miller Continuous Wireway Flourescent Lighting System, constructed to comply with wartime regulations for conservation of critical materials —the same as introduced in 1939.

2 RUGGED LIGHTWEIGHT EQUIPMENT —rigid compact channels and Masonite reflectors—no reduction in lighting efficiency.

3 EXPOSED BALLAST for coolest possible operation—all wiring concealed but accessible upon removal of lightweight reflector.

4 LAMPHOLDERS rigidly mounted back-to-back for mutual stiffening and maintenance of spacing. Miller patented lamp lock also available, minimizing danger of falling lamps.

5 LOW INSTALLATION COST — savings of 30-50% again possible by use of 8 foot and 10 foot rugged double length channels—one suspension per channel section—simplified wiring in continuous rows.

6 SIMPLIFIED MAINTENANCE—ballasts, lampholders and starters readily accessible — starters located between lamps.

7 UNIFORM ILLUMINATION—the 30 to 50 or more footcandles required for war production easily obtainable from practical row spacings.

We suggest you write or wire today for complete information.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

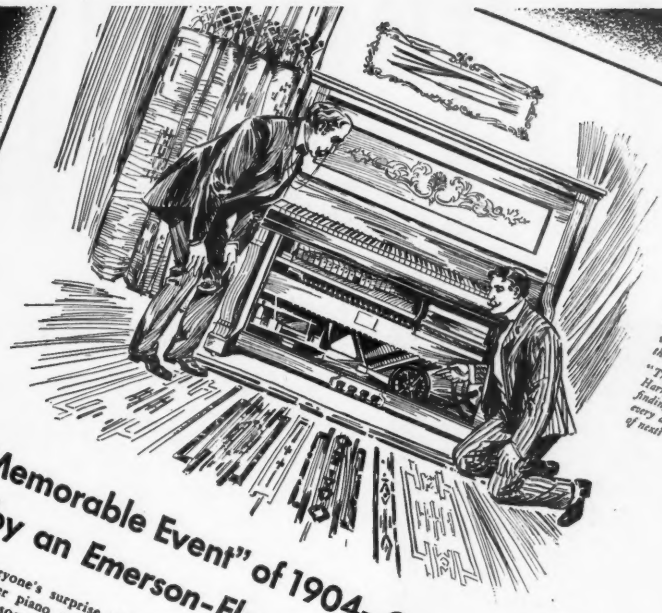
ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844



"Look, Harry, with this Emerson-Electric motor, the player piano will play itself!"

"You don't mean, George, that it will really play without pumping the foot pedals?"

"That's exactly what I mean, Harry—those motor people are finding new uses for electric motors every day. What will they think of next?"

A "Memorable Event" of 1904—Created by an Emerson-Electric Motor

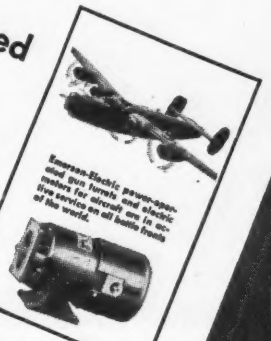
IMAGINE everyone's surprise when, in 1904, a player piano actually "played itself"—an Emerson-Electric Motor had been installed!

This early innovation may seem trivial compared to the contribution of Emerson-Electric Motors in later years. But, it was this early pioneering that helped make present-day motor-driven appliances and equipment possible.

Think of living without electric motors to operate our washing machines, ironers, vacuum sweepers, refrigerators, fans, heating systems, and the numerous types of equipment in industry and commerce. The American way of life is powered with electric motors.

Now, Emerson-Electric is working full time for Victory. Wartime necessities are providing invaluable experience and creative research in a new and vastly enlarged field of manufacturing operations, particularly in light metals and plastics. "After Victory", manufacturers of new and improved motor-driven appliances can turn with complete confidence to Emerson-Electric for motors that will do the job better and stay on the job longer—motors that will meet the challenge of a post-war world.

THE EMERSON ELECTRIC MFG. CO.
SAINT LOUIS
Branches: New York • Chicago • Detroit • Los Angeles • Davenport



Emerson-Electric power-operated gun turrets and electric motors for aircraft are in active service on all battle fronts of the world.

Musical, Sound and Radio Instruments Operated by Electric Motors

COIN-OPERATED AUTOMATIC RECORD PLAYERS
RADIO-PHONOGRAPH WITH RECORD CHANGER
VOICE RECORDERS
RADIO COMMUNICATING SETS

The War Bonds You Buy Today Will Provide the Electrical Appliances You'll Want After Victory

EMERSON ELECTRIC
MOTORS • FANS • APPLIANCES

Collier's

Reproduction of page advertisement appearing in COLLIER'S, issue of December 25, on the newsstands December 18.

Dealers Really Appreciate *This Kind of Service . . .*

As a vital contribution to the war effort, Emerson-Electric Dealers are doing an outstanding job of keeping appliances in good working order on the home-front-line . . . The Service Department of Emerson-Electric is doing its share, too—by giving special attention to requests for parts and service . . . Commenting on this, Mr. E. D. Little, Newell Electric Co., Orlando, Florida, writes:

"I would like now to say that your Service Department is on a par with the product, and that is some statement to make. *You have always given us the best service and attention that is possible."*

THE EMERSON ELECTRIC MANUFACTURING CO.
SAINT LOUIS

Branches: New York • Chicago • Detroit • Los Angeles • Davenport

354

EMERSON ELECTRIC ELECTRIC

MOTORS • FANS • APPLIANCES

WHAT'S AHEAD

G-E RESEARCH SCIENTISTS FORESEE THESE SIX IMPROVEMENTS IN FLUORESCENT LIGHTING

FLUORESCENT lighting has come a long way in the five years since General Electric first announced it to the American public and made the first installations at the New York and San Francisco World Fairs. And it's going still farther. As a result of G-E research in fluorescent for war needs, G-E research scientists foresee additional improvements that can and will be made . . . improvements that will help produce a vast new postwar lighting market for G-E Lamp agents.

No, these improvements aren't all ready now. G-E engineers and research scientists are busy with urgent war tasks. But they will be ready as soon as conditions permit . . . and meantime millions of G-E Mazda fluorescent lamps in American war plants are helping bring that time nearer faster.

3 **Improved color quality,** thanks to new and better phosphors developed by G-E research.

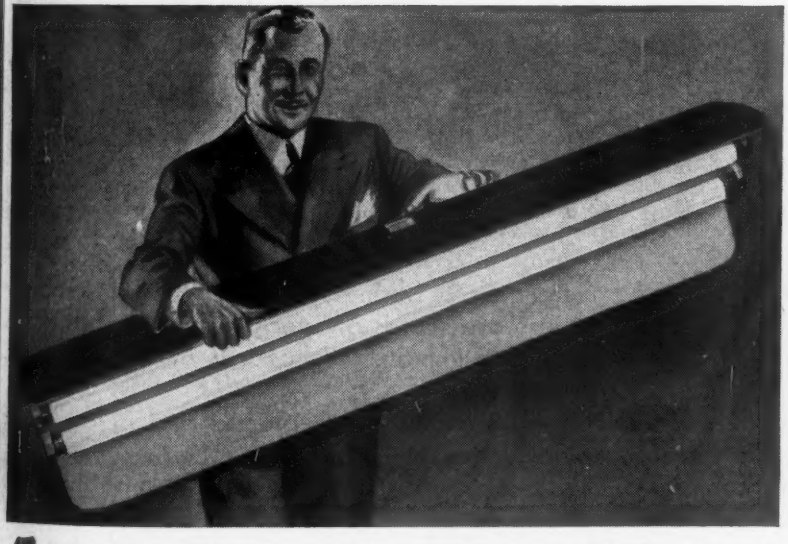
4 **The G-E Watch Dog Starter** is already here. Faster starting — much greater uniformity. No blinking when tubes burn out.

GENERAL ELECTRIC

IN FLUORESCENT

1 Better lamp performance throughout life as result of new type of cathode construction.

2 Lower cost — both on original installation and over a period of years.

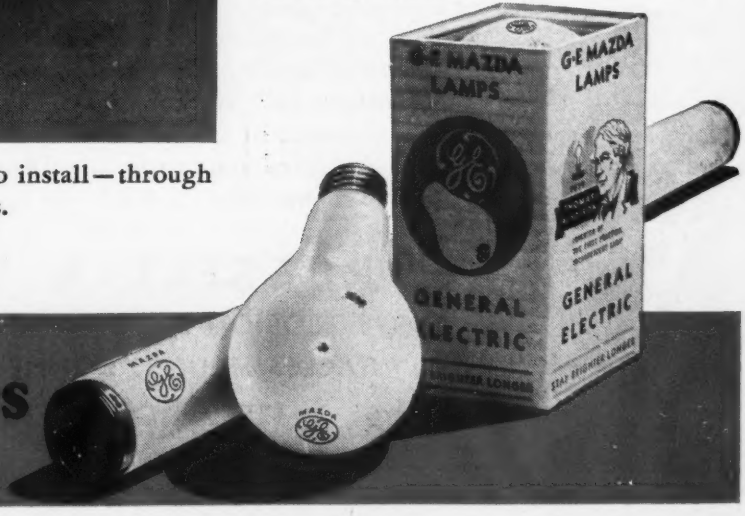


5 Better Fixtures—more efficient and easier to install—through G-E's cooperation with fixture manufacturers.

"TO MAKE LAMPS STAY BRIGHTER LONGER"

The Creed of G-E RESEARCH

6 Stay Brighter Longer, through better maintenance of light output for the rated life of the tube. To make lamps . . . all types . . . stay brighter longer is the creed and constant aim of General Electric Lamp Research.



G-E MAZDA LAMPS

All Attacks Repelled

Making electric service safe and sure has been the sole business of Russell & Stoll Company since 1902. For each hazardous industry there are scores of specially constructed R & S connectors, switches and lighting fixtures which eliminate the hazards of water, vapor, dust or explosive gases.

And in all industries, the well known R&S Ever-Lok receptacles and plugs insure against failure of service due to faulty connections.

R&S catalog No. 90, contains 300 pages of information, and is presumably in the hands of all electrical engineers, contractors and jobbers. If you did not receive your copy, please write us on your company stationery. If it isn't in the catalog, R&S will consider making it.

Since 1902

RUSSELL & STOLL COMPANY

EXPLOSION-PROOF WATER-TIGHT AND EVER-LOK RECEPTACLES, PLUGS, CONNECTORS, SWITCHES AND FIXTURES

125 BARCLAY STREET • NEW YORK 7, N. Y.

More and more manufacturers choose Masonite* Reflector Shapes

THE increasing popularity of the new Masonite Reflector Shapes is shown in the fact that practically all of the leading fluorescent lighting manufacturers are today using them.

There are many reasons for this wide acceptance. First of all, Masonite Reflector Shapes mean *quicker installation — easier servicing.* They resist moisture . . . have a very low electrical conductivity . . . are non-scaling and cannot rust. Fine finishes are easy to apply, bond perfectly with these boards — the resultant smooth surface assuring a high reflection factor.

Originally inaugurated as a wartime substitute for metal, these rugged, light-weight reflectors are proving by performance to have definite advantages—pointing the way to great post-war possibilities.

Get acquainted with this easy-to-handle, dense and durable material. Then you'll do as so many manufacturers are doing today — choose Masonite Reflector Shapes. For complete details, please write Masonite Corporation, 111 W. Washington St., Chicago, Illinois.

MASONITE CORPORATION

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1944, MASONITE CORP.

It's Right MASONITE

MONITOR MOTOR CONTROL

Monitor

The Original "JUST PRESS A BUTTON" System

Yesterday · Today · Tomorrow

Since 1888 . . . when Monitor engineers introduced automatic electric motor control to industry through the medium of the Automatic Direct-Current Motor Starter..."firsts" have become a habit with Monitor. The solenoid-magnet starter, the belt driven starter, pre-set speed automatic motor control, the Monitor Thermaload Starter—only a few of many Monitor "firsts"—have played their part in the growth of two of America's achievements . . . our mass-production system and our standard of living.

Other "firsts" are on their way . . . to be used as standard equipment and to become integral parts of the custom-built control panels that Monitor will be called upon to build in tomorrow's automatic age.

Monitor Automatic Motor Controls and Equipment can be furnished to meet every motor control problem. Consult the Monitor engineer in your locality.

The Monitor Controller Company

GAY, LOMBARD and FREDERICK STS. • BALTIMORE-2, MARYLAND

Specify Monitor
AUTOMATIC MOTOR CONTROL
... it pays dividends in performance

A NATION-WIDE NETWORK OF MONITOR SERVICE ENGINEERS TO SERVE YOU

BALTIMORE, MARYLAND
Mr. C. N. Lehr
51 South Gay Street

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Mr. N. A. McCoy
89 Broad Street

BUFFALO, NEW YORK
Mr. William G. Merowit
436 Niagara Street

CHATTANOOGA, TENN.
Mr. Earl E. Wright
1231 Market Street

CHICAGO, ILLINOIS
Mr. G. C. Unger
407 S. Dearborn Street

CINCINNATI, OHIO
B. A. Wesche Electric Co.
1622-28 Vine Street

Mr. G. H. Armstrong
P. O. Box 25, Sta. K

CLEVELAND, OHIO
Mr. J. E. Wood
1900 Euclid Avenue

COLUMBUS, OHIO
Reeves Machinery Co.
499 S. Third Street

DETROIT, MICHIGAN
Mr. S. C. Dinsmore
10228 Woodward Avenue

Mr. R. L. Lawrence
10228 Woodward Avenue

GERMANTOWN, PHILA., PA.
Mr. R. B. Brown
18 W. Chelten Avenue

HARTFORD, CONNECTICUT
Mr. R. B. Soderberg
P. O. Box 904
410 Asylum Street

HOUSTON, TEXAS
Mr. Lynn Elliott
P. O. Box 34

KALAMAZOO, MICHIGAN
Mr. E. B. Dewey
P. O. Box 442

LOS ANGELES, CALIFORNIA
Mr. E. Zinsmeyer
729 Turner Street

A. R. Slimmon Company
445 E. Third Street

MINNEAPOLIS, MINNESOTA
Mr. A. Wickstrom
Plymouth Building

NEW YORK, NEW YORK
Mr. C. F. Goodwin
75 West Street

Mr. R. F. Goodwin
75 West Street

Mr. C. R. Speaker
General Motors Building

PITTSBURGH, PENNSYLVANIA
Mr. C. J. Mundo
Union Trust Building

ST. LOUIS, MISSOURI
Mr. E. A. Schmidt
1410 Shell Building

WASHINGTON, D. C.
Mr. I. M. Day
718 Mills Building

Mr. C. R. Speaker
1192 National Press Bldg.

Electrical Contracting

JOBS WILL DECIDE

Assuming a scale of $1.50 an hour it ordinarily takes about 10,000 dollars worth of electrical construction work to keep one journeyman steadily employed for one year. There are about 110,000 I.B.E.W. men who work in this industry. At full time their pay envelopes would total $396 millions. To support that much of a productive payroll would require about 1 billion dollars per year in total business volume.

This picture, over simplified as the above rendering may be, is one that ought to be constantly in our thinking from now on. Because the industries which will get the first consideration in postwar readjustment will be those which provide jobs, especially well paid, stable jobs for skilled men.

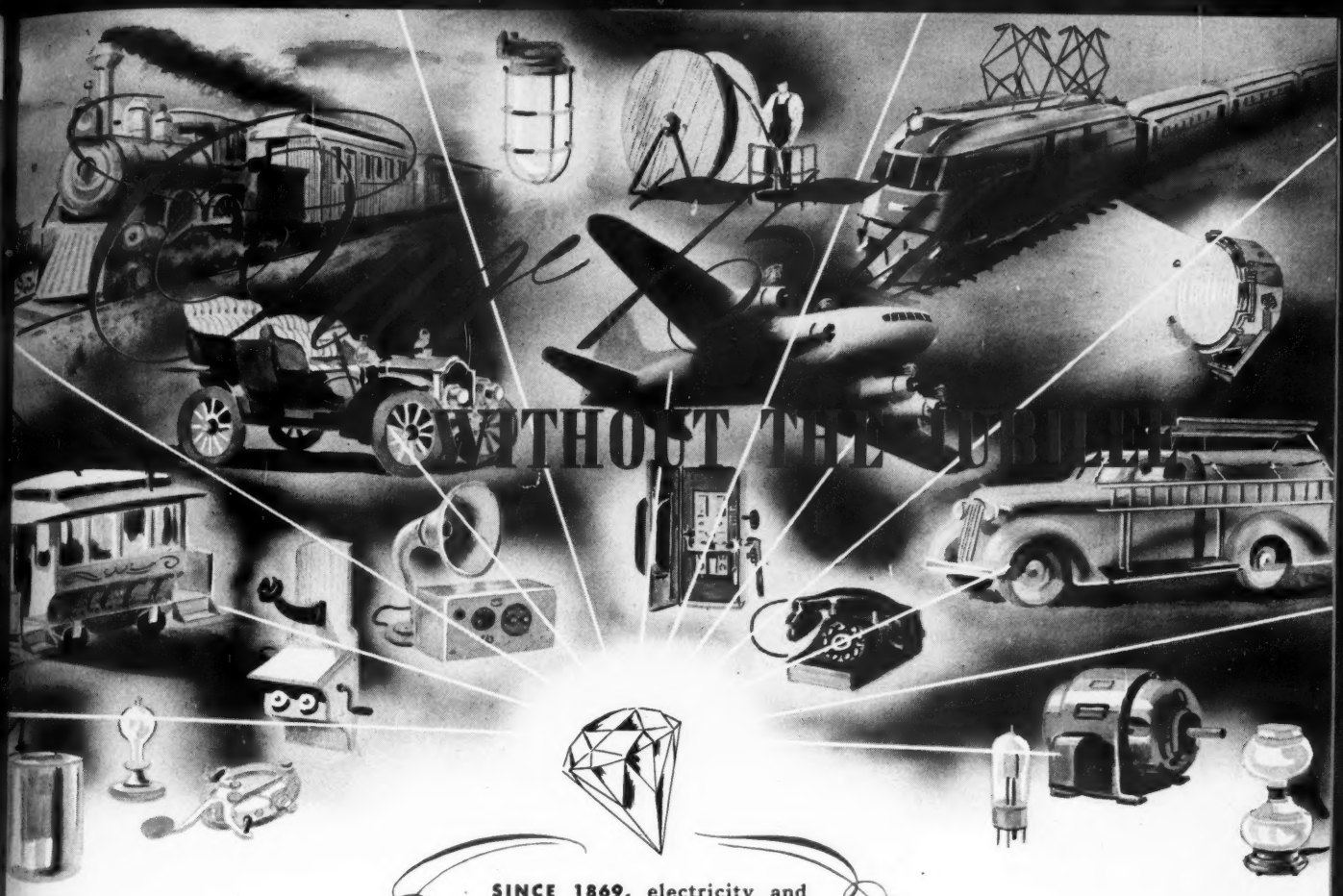
The reports of experienced news men who have talked with the boys at the fronts are unanimous on one point —that they want to come back to no dole, WPA nor government support. They expect to get good, honest, productive work in industry. They'll get what they want. And the going business that can offer jobs in productive private enterprise will be in a position to speak boldly and confidently in any council of government, labor or industry.

The business of installing and maintaining wiring, lighting and electrical apparatus is in a line of technical progress offering unique opportunities for creative market development, which is just another way of saying new jobs. And how far we go toward meeting the opportunity is pretty much up to us as individuals and as an industry—with one important hitch.

Inevitably, across the path of planning and progress falls the ominous shadow of taxation. Can we save enough of today's earnings to build tomorrow's business and create tomorrow's jobs? Will our legislators and administrators be blessed with the economic wisdom and foresight to create a tax environment in which creative business can grow vigorous and strong? It is hardly likely that we can expect greater wisdom than in the past, but we can depend upon frank political realism.

Jobs will decide the issue. If taxation stifles postwar job opportunities, the tremendous weight of great political forces, labor, the returning service man and industry will rally on the side of jobs. And we can be certain that jobs will write the tax bills. So in setting our sights to future business, in planning our market development, and in building a billion dollar business, it is imperative that we keep our representatives perpetually conscious of the direct relation between good business, good jobs and sound taxation policies.

Wm. T. Stuart



SINCE 1869, electricity and GRAYBAR have grown up together. Through peace and war, with every electrical advance, GRAYBAR has extended its distribution services in step with the needs of the day . . . and of the Nation.

Sure, it's something for GRAYBAR to be 75 – but all the busy years behind us mean nothing to you, or to America, except as they have improved our perspective for today's first job.

In a modern war, every industrial method or technique is a weapon matched against the production forces of the enemy. In your job, you have to help outclass some of Hitler's crowd this very morning. So have we at GRAYBAR, and we can't do it with our heads turned toward the past.

Thus, we're chiefly glad to be 75 because the amassed experience of those years – the long slow process of "learning the ropes" – is helping us meet each new and critical problem of electrical supply and distribution better than we could hope to do as a youngster at the game. And we can't imagine a better use to make of it.

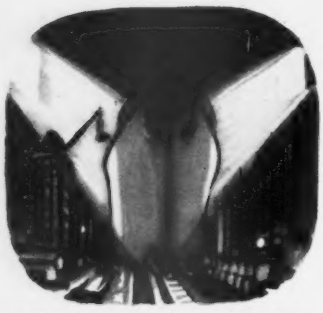
Beyond that, we think the perspective of many years of peace-time electrical progress – antedating even lamps and motors – will help us to serve you better in the "conversion" and post-war years. (As for the jubilation, we'll save that to add to yours on V-day!)

GraybaR

IN OVER 80 PRINCIPAL CITIES

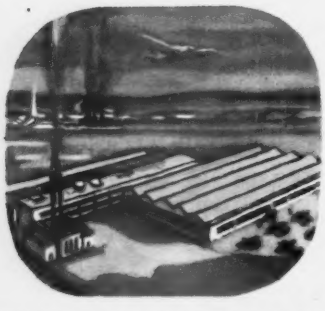
First Service of Supply for

GRAYBAR *in War*



PRODUCTION SUPPLY

Electrical parts and materials to be installed in ships, planes, communications units and other "fighting front" equipment are GRAYBAR'S No. 1 responsibility today. With them goes specialized service to aircraft plants, shipyards and all other key war plants; on selection, application procurement and scheduled delivery.

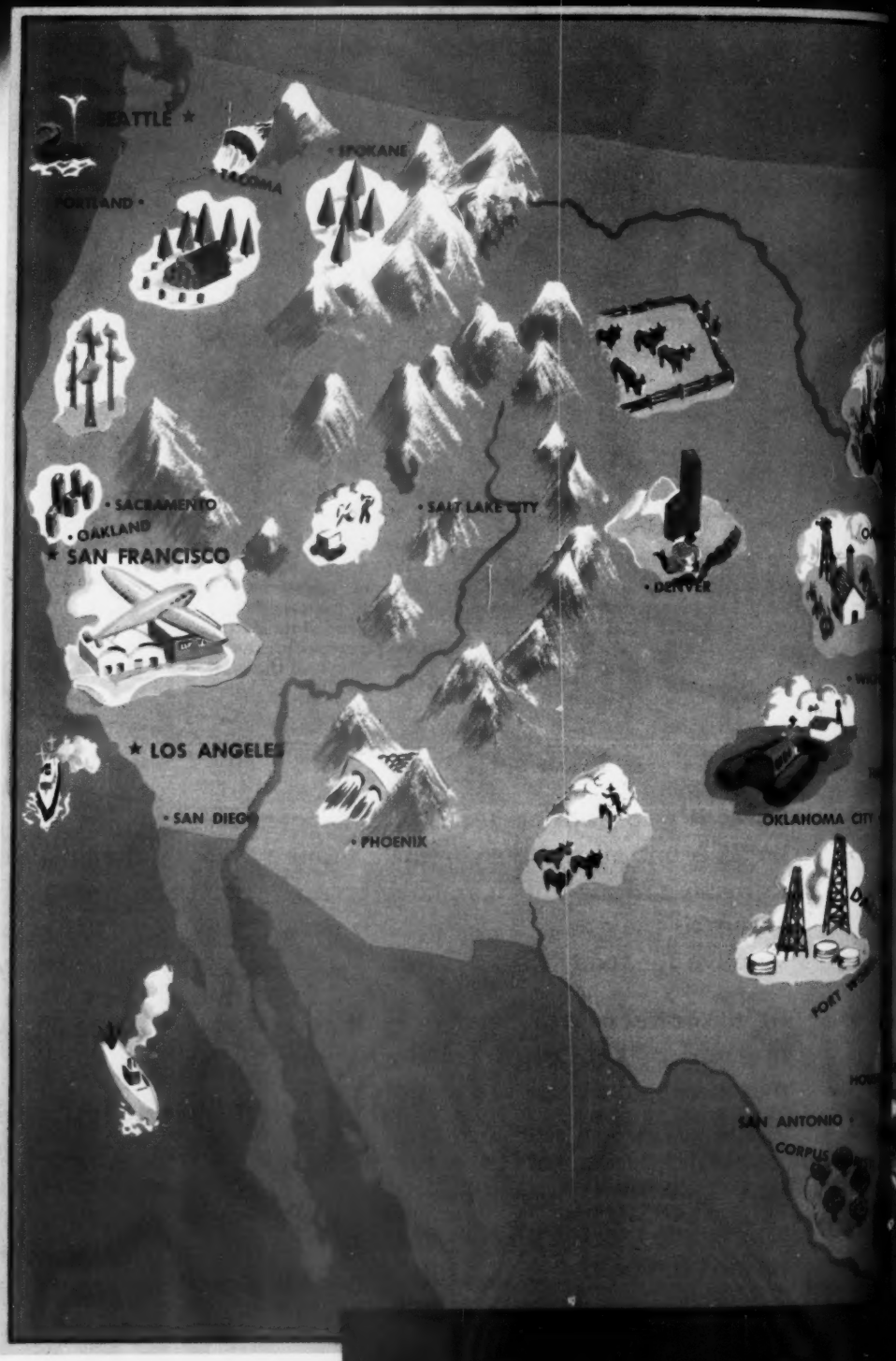


CONSTRUCTION SUPPLY

Back of America's mighty war plant—military and industrial—is a phenomenal construction job. Electrical contractors, engineering firms and the military services engaged in the work depended upon GRAYBAR as a time-saving connecting link with the makers of thousands of different electrical construction items.

MAINTENANCE SUPPLY

To keep our productive machine running full-tilt, to distribute power, to light the work, and maintain communication lines, GRAYBAR speeds electrical replacement parts to points of greatest need. Emergency procurement "via GRAYBAR" has saved millions of productive man-hours.



Grayba

MOBILIZATION POINTS IN OVER 8

Executive Offices: GRAYBAR BLDG., NEW Y

Bringing together more than fortune

...y for an Electrical Nation

GRAYBAR *in Peace*

CONTRACTOR'S SUPPLY

The peacetime job of reequipping America electrically will get its start with electrical contractors: Plants, homes, offices, institutions, stores and buildings of every type will be demanding conversion and betterments. To contractors, GRAYBAR will once more bring the newest and best in wiring materials, lighting units, signaling equipment.

APPLIANCE DEALER SUPPLY

To dealers handling electrical appliances, GRAYBAR will again be back with the fast-moving popular items that help build a sound and solvent business. With so much new and untried merchandise coming to market, you'll appreciate GRAYBAR'S help in selecting the better lines.

REHABILITATION SUPPLY

Distribution services, tailored to the the electrical reconversion needs of industrial plants, public utilities, municipalities, railroads, telephone companies, etc., will be more essential than ever. Experienced GRAYBAR specialists will again be devoting themselves to the special electrical needs of each such group.

...facturers 20,000 customers

Teamwork...DOWN THE YEAR

On its 75th Anniversary, GRAYBAR is proud of its long-lasting relationships with leading suppliers. This intimate contact assures you of more complete product information, greater support in expediting emergency orders, and twofold co-operation in assuring a satisfactory purchase.

BEFORE 1900

Alabax Division of Pass & Seymour, Inc.
American Crossarm and Conduit Company
American Electrical Heater Co.
American Steel & Wire Company
The Ansonia Electrical Company
The Arrow-Hart & Hegeman Electric Co.
Boston & Lockport Block Co.
The Bryant Electric Company
Calculograph Company
Crouse-Hinds Company
Diamond Expansion Bolt Company, Inc.
Edwards and Company
The Electric Storage Battery Co
General Cable Corporation
General Electric Company
Habirshaw Cable and Wire Div. Phelps Dodge Copper Products Corporation
Harvey Hubbell, Inc.
Jefferson Electric Company
Leach Company
Mathias Klein & Sons
National Carbon Company, Inc
National Pole & Treating Co
The Okonite Company
Owens-Illinois Glass Company Hemingray Division
Self-Winding Clock Co., Inc.
Stanley & Patterson Division Schwarze Electric Company
The Thomas & Betts Co.
Western Electric Company
Weston Electrical Instrument Corporation
The Whitney Blake Company

BEFORE 1910

Frank Adam Electric Co.
Benjamin Electric Mfg. Company
Boston Wove Hose & Rubber Co.
Columbia Metal Box Co.
Hamilton Beach Company Division of Scovill Manufacturing Company
The Holtzer-Cabot Electric Co.
Hubbard and Company
Ilg Electric Ventilating Co.
Indiana Steel & Wire Company
International Creosoting & Construction Co.
McGill Manufacturing Co., Inc Electrical Division
National Electric Products Corp
National Fireproofing Corp.
The National Telephone Supply Company
Simplex Wire & Cable Co
Square D Company Switch and Panel Division
Veeder-Root, Inc. The Wiremold Company

BEFORE 1920

BullDog Electric Products Co
Bussmann Mfg. Co.
A. B. Chance Co. Utilities Division
Churchill Cabinet Company
Curtis Lighting
Dossert & Co., Inc.
Economy Fuse & Manufacturing Company
Edison General Electric Appliance Company, Inc.
Thomas A. Edison, Inc.
Faries Manufacturing Company
The Fibre Conduit Comany
Fullman Manufacturing Co.
The Gray Manufacturing Co.
Kopp Glass, Inc.
Ward Leonard Electric Company
Manning, Bowman & Co.
Mitchell-Rand Insulation Co., Inc
Frank W. Morse Co.
Mueller Electric Co.
National Lead Co.
National Sewing Machine Co.
Philadelphia Electrical & Manufacturing Co.
Russell & Stoll Co., Inc.
H. B. Sherman Manufacturing Co
Templeton, Kenly & Co.
The Trumbull Electric Mfg. Co
Union Insulating Co.
The F. W. Wakefield Brass Co.
The Youngstown Sheet and Tube Company

BEFORE 1930

The Adjustable Fixture Company
Appleton Electric Co.
Armstrong Cork Company, Inc
Blaw-Knox Company
L. S. Brach Mfg. Corp.
J. H. Bunnell & Co., Inc.
Chase Brass & Copper Co., Inc.
Chicago Flexible Shaft Company
Clayton & Lambert Mfg. Co.
Coffing Hoist Company
Cook Electric Company
T. J. Cope, Inc.
Copperweld Steel Co.
Day-Brite Lighting, Inc.
Electrical Engineers Equipment Company
Elkhart Rubber Works
Ericson Mfg. Co.
The Everstick Anchor Co
Fahnestock Electric Co.
Federal Electric Company
The Four Wheel Drive Auto Co. Eagle Division
Frankel Connector Co., Inc
General Radio Company
The A. C. Gilbert Company
Greenlee Tool Company
Hankscraft Company, Inc
Hart Mfg. Co., Inc.
Hub Electric Corporation
Ideal Commutator Dresser Co.
Inland Glass Works Division of Chamberlain, Inc.
Kester Solder Co.
The H. R. Kirkland Company
Kleigl Brothers
Leeds & Northrup Company
Leich Electric Co.
The Linen Thread Co., Inc.
Lufkin Rule Company
W. N. Matthews Corp.
McEvoy Cord & Cable Co., Inc.
McGraw Electric Company
Minnesota Mining & Mfg. Co.
Murlin Mfg. Co.
Northern Industrial Chemical Co.
H. K. Porter, Inc.
Radiotron Division R.C.A. Mfg. Co.
Reliable Electric Company
Revere Clock Company
Revere Electric Mfg. Co.
Reynolds Electric Co.
W. H. Salisbury & Company
SherwinWilliams Co.
Steel City Electric Co.
Steel and Tubes Division Republic Steel Corporation
Stromberg Carlson Company
Struthers Dunn, Inc.
The Swartbaugh Mfg. Co.
Telkor, Inc.
The Thompson Electric Co
The Union Metal Mfg. Co.
United Metal Box Co.
United Motors Service, Inc.
Warren Telechron Company
Weber Electric Company
Webster Electric Company
Wesix Electric Heater Co.
Wheeler Reflector Company
Edwin L. Wiegand Company
Daniel Woodhead Company

BEFORE 1940

L. B. Allen Co., Inc.
American Brake Shoe & Foundry Co.
American Manufacturing Company
The Art Metal Company
The Autocall Company
Burgess Battery Company
Century Lighting, Inc.
Colt's Patent Fire Arms Mfg. Co.
Cordley & Hayes
Corning Glass Works
Cory Glass Coffee Brewer Co
Dazor Mfg. Co.
W. C. Dillon & Company, Inc.
The Duff-Norton Mfg. Co.
The Emerson Electric Mfg. Co
G & W Electric Specialty Co.
The P. A. Geier Company
Gibson Electric Refrigerator Corp
Gillinder Brothers, Inc.
Gleason-Tiebout Glass Co.
Greist Mfg. Co.
A. E. Halperin Co., Inc.
Hobart Mfg. Co.
Horni Signal Mfg. Corp.
Independent Pneumatic Tool Co.
Jensen Radio Mfg. Co.
Kelvinator Div. of Nash-Kelvinator Corp.
Knox Porcelain Corp.
Landers, Frary & Clark
Lewis Sanitary Tool Co.
Lorain Products Corporation
Hugh Lyons and Company
McCabe-Powers Auto Body Co
The Mercoid Corporation
Mica Insulator Company
Mineralac Electric Co.
Mitchell Manufacturing Co.
National Enameling & Stamping Company
Noblitt-Sparks Industries
Noma Electric Company
Ohio Brass Company
Owens-Corning Fiberglass Corp.
Par-Metal Products Corp.
Philco Corporation Storage Battery Division
Pittsburgh Reflector Co.
Premax Products Division of Chisholm Ryder Co., Inc.
Prime Mfg. Co.
Proctor Electric Company Div. of Proctor & Schwartz
Raytheon Manufacturing Co. Electrical Equipment Division
Rival Mfg. Co.
St. Louis Cordage Mills
Sangamo Electric Company
Scanlon-Morris Co.
Seymour Smith & Son, Inc.
Silvray Lighting, Inc.
Sonora Radio & Television Corp.
Southern Asbestos Co.
Steam-O-Matic Corp.
Steber Manufacturing Co.
Stewart-Warner Corporation
Superior Neon Products Corp.
Teletype Corporation
Thermador Electrical Mfg. Co.
Triangle Conduit & Cable Co.
The Utica Drop Forge & Tool Co.
Vulcan Electric Co.
Waring Corporation
Western Block Co.

SINCE 1940

Andertube Manufacturing Co.
Betts & Betts Corp.
Detroit Macoid Corporation
The Dexter Company
R. W. Fieroh Company, Inc.
Peter Gray, Inc.
Heinze Electric Co.
Holophane Co., Inc.
International Derrick & Equipment Division of International Str. Corp.
Justrite Manufacturing Comp.
Killefer Manufacturing Corp.
Lister-Blackstone, Inc.
Donald P. Mossman, Inc.
Paragon Electric Co.
Perkins Marine Lamp and Har. Corp.
Precision Castings Co.
Seamless Rubber Co.
F. A. Smith Mfg. Co., Inc.
Smoot-Holman
Surprenant Electrical Insulat.
The Tappan Stove Company
Viking Instrument Co.
E. R. Wagner Mfg. Company
Walker Electrical Company
Wilcox, Crittenden & Co.
Willard Storage Battery Co.
Wilson Welder and Metals Co.

To Bring Them Back More Quickly

To the 503 GRAYBAR employees now in service, the "home folks" in offices and warehouses have pledged unstinted support. If service in your behalf can help to end the war more quickly, your call will get "all-out" co-operation – day or night.

★
503

GraybaR

IN OVER 80 PRINCIPAL CITIES

POSTWAR

Creative thinking today is pointing the way to better methods, more jobs, and sound business tomorrow. Here is the story of postwar planning in the electrical construction industry gathered by interviews and correspondence with industry leaders across the country.

By W. T. Stuart

UNDER the cold midnight fluorescents in individual offices over the country, in the councils of NECA, and in local associations busy men are giving of their scarce time to the future of all of us. Postwar planning has become the commonplace term for this unique and vital economic engineering. For as military strategists must prepare for the impact of changing theatres of war on their service of supply, so industrial strategists must prepare the channels of commerce for the impact of peace.

There are many reasons offered why planning now is useless; the uncertainties of war, an unfriendly administration, inevitable depression, revolutionary changes buried in military secrecy, and a host of others. But in confidence of military victory, in confidence that democracy always finds its way to the greatest benefit of the people, and in confidence that free enterprise can give our nation prosperity, a course may be struck—and must be. Planning for after the war is an imperative duty. As we set a time for tomorrow's rising, though a variety of unexpected situations may present themselves in the day's work, we are there and prepared to cope with them.

Forces in Action

Let's look first at some of the economic pressures that are building up behind postwar electrical construction and electrification.

1. Greatly enlarged wartime generating capacity in public and private plants will be seeking a market which can be reached only through wiring systems.
2. New appliances and home devices will be dependent upon adequate wiring for proper operation.
3. Strengthening of safety codes will bring pressure toward improvement in substandard installations and accelerated obsolescence of over-age equipment.
4. The return of highly competitive selling will create markets for improved commercial lighting.
5. Competitive efforts of office buildings to rent space to revived sales offices will stimulate rewiring and relighting.
6. Rapid forced obsolescence of existing wiring and apparatus through overloading and inaccessible technical progress during the war.

Each background force provides additional momentum to the specialized efforts of the electrical construction industry. They will operate through utility sales programs, league activities, the National Adequate Wiring Bureau, Better Light—Better Sight, trade conferences and through other programs and promotion. But they will all stimulate the further use of wiring, lighting and apparatus.

Planning Activity

Postwar planning activity takes on broad industry problems of stabilization, ethics and labor relations in the NECA-IBEW plan. It becomes more specific in regional and local programs, for here, in the final analysis, rests the direct responsibility for shifting our economy from war to peace.

In the agricultural Middle West and along the newly industrialized West Coast postwar prospects have distinctly regional characteristics. In the industrial East and East Central areas the emphasis is on developments which follow closely on prewar programs.

The prospective markets group under five major heads; reconversion of industrial plants, modernization of commercial structures, house wiring, rural electrification and public works.

Reconversion

The most immediate postwar opportunity will be industrial reconversion to the manufacture of peacetime products. This is the consensus of interviews by *Electrical Contracting's* staff with industry leaders across the country in recent weeks. The program will probably get under way well before the end of the war and it is expected that some of the first materials released from

NECA-IBEW planning committee operates on a labor-management scale. They are (l. to r.) Wm. D. Walker, William J. Varley, William F. McCarter, T. J. Reneburg, J. Scott Milne, Paul M. Geary, Marion H. Hedges, G. W. Alexander, George Andrae, Frank W. Jacobs, S. C. Sachs, Joseph Macintosh.

the war program will be directed toward this channel.

Along the West Coast reconversion is considered the most realistic electrical contracting market. Though many new and large war manufacturing plants have been built, hundreds of smaller plants were converted to subcontract work. Overloading and make shift has been the rule. Reconversion to peacetime products will require extensive change-over and modernization.

In industrial areas of the East and Middle West, the planning also forecasts a very substantial volume of industrial reconversion work. Little new industrial construction is predicted by electrical men, but it is expected that postwar competition in the manufacturing field will force the installation of efficient and flexible electrical systems to keep in step with the efficiency of the new war-created plants.

Several specific projects are reported as underway or being considered as aids to reaching the reconversion market, among which are:

(1) Customer education on the costs of excessive voltage loss and poor power factor conditions.

(2) Surveys of industrial plants as an aid to their postwar planning.

(3) Sale of high quality specialized lighting systems.

(4) Educational preparation for the increased use of electronic methods in industrial processes and process control.

(5) Contract maintenance as an immediate contact with the industrial's wiring problems and a ground floor opportunity to cooperate in reconversion planning.

Commercial

The immediate postwar opportunities in commercial wiring, lighting and apparatus is seen with varying degrees of optimism differing mostly on the time when the market will be ready. The pent-up, unsatisfied demand for modern lighting will become apparent as soon as materials and fixtures are available. But some cautious observers predict that the real market will not break until plentiful supplies of civilian and luxury goods put the added force of competition behind store and office modernization.

New commercial construction will provide a major element in postwar building. The modern lighting methods, air conditioning and other up-to-date features of new commercial construction are expected to stimulate modernization and rehabilitation of existing stores.

Residential

Of all the postwar prospects, none is more potent than housing. From the Pacific shores, where huge populati shifts will offer extraordinary proble in permanent housing, to the stable i dustrial cities of the East, where blight areas and substandard housing are pe ennial civic headaches, home buildi holds the promise of being one of t greatest markets for wiring, appliance lighting and apparatus of our history.

The continuation of pre-war prom tion has kept the subject of adequate wi ing and good lighting vigorously ali Practically all of the projected gadge that industrial ingenuity promises i the postwar house is dependent up wiring in some way. The planning, ho ever, to handle this great potential vari from indifference to wild-eyed enthu iasm.

The almost unanimous prediction th housing will run in the order of a m lion homes a year is tempered by co cern over how the electric work will handled. Will curbstone operation s the pace of profit and initiative? W industry programs run up against t indifference and negative selling of pr per outlet competition?

Two current plans try to answer the problems. The NECA plan of foster the establishment of specialized, w organized, efficient, house wiring firms every city would make possible m wiring techniques and aggress

market development. The National Adequate Wiring Bureau and league plans aim to bring the pressure of public demand for adequate wiring on the speculative builder. Several well established contracting concerns are privately studying the possibilities of handling house wiring. If house wiring can be lifted away from minimum code and minimum cost thinking the sky is, almost literally, the limit. And some predict average wiring contracts running as high as 10 percent of the building cost.

In the West, where kilowatt hour consumption has always been high and where appliance use is very extensive the elimination of the No. 14 wire standard is under consideration together with a vigorous home re-wiring campaign. Utilities plan to put salesmen in the field to do the doorbell pushing. Inspectors and the unions are in on the planning.

In the Chicago area some population shift is expected before a housing boom will materialize but an immediate and pressing market for rewiring existing homes and apartments is seen.

In the Detroit area there are some thirty suggestions piling up from the activities of an Electrical Association committee. Sifted down to six major themes, the plans are in the hands of the committee for intensive exploration. Adequate wiring, rewiring, all-electric kitchen planning and the development of new uses of electricity in the home (i.e. air conditioning, deep freeze refrigeration, etc.) are in the study.

Among the ideas that are being brought forth for home electrification planning are some which may eventually revolutionize home wiring design. Most imminent of these is inbuilt fluorescent lighting providing the same high levels and quality that are now familiar in stores, offices and factories.

A sound communication system for answering the doorbell from convenient points within the home may well find as universal a market as the now conventional chimes.

Night lighting, using new low wattage fluorescent lamps, looks like one of the first items which will appear in revised adequacy standards. As a part of inbuilt lighting fixtures or as separate near-the-floor shielded units the current consumption is negligible and the sales appeal dramatic.

Already under discussion is a system of individual electronic heat control for each room. And further off, comfort control heating from radiant panels, the base heat loss made up by a conventional heating plant, the comfort level margin established and maintained electrically. Near infra-red lamps in bathroom wall fixtures for quick heat and sun lamps for winter health, sterilizing lamps for dish cupboards and refrigerators and a host of improvements in appliances will also affect house wiring contracts.

Farm Wiring

In the great farm areas of the Middle West, rural electrification is the core of postwar plans. Wartime concessions to conserve materials are proving irksome to farmers and the trade and it is predicted that farm work will go back to pre-war standards or higher as soon as materials are available. Plans are underway for re-inspection programs to replace emergency wiring and uncover hazards, sponsored by rural groups.

Problems of adequacy are considered even more important in farm work than in urban areas, since the rural installation must serve much more equipment than the city home uses. Water pumping, hot water for stock, feed grinding, milkers and a host of other "production" jobs burden the lines.

At a recent meeting of the American Society of Agricultural Engineers it was predicted that within 10 years after the war at least 4 million farms will be using 24-hour electric service. The figure today is about 2½ million, out of approximately 6 million farms in the United States.

NECA—IBEW Plan

The National Electrical Contractors Association was among the first organizations of American business to inaugurate industry-wide planning under a labor-management committee. And the first report of this committee shows a frank realism, a refreshing absence of "blue sky stuff" and an enlightened recognition of the common stake of contractor and skilled mechanic.

Basically the committee has developed their objectives along three lines—

(a) Maintenance of a strong and vigorous industry through the remaining war years and the transition period.

(b) Stabilizing the industry through better business methods and broader opportunities in the postwar era.

PRELIMINARY ESTIMATE OF POST-WAR NEW CONSTRUCTION 1/

From the report of the Market Analysis Committee of the Producers Council, Inc.

(Millions of Dollars)

Type	Average Year *1938-1940*	First 12 mos. After Final *Armistice* Current Prices 4/	Average Year *1947-1951* 1940 Prices	Average Year *1947-1951* Current Prices 3/	Elec. Work *1947-1951* Current Prices 5/
PRIVATE:					
Residential	2,057	2,100	4,910 2/	6,383 2/	383
Community Facilities	521	1,100	1,435	1,865	169
Industrial	278	590	650	845	127
Farm	231	500	450	585	58
Public Utility	554	1,000	1,000	1,300	117
TOTAL PUBLIC:	3,641	5,290	8,445	10,978	854
TOTAL	2,451	3,500	4,045	5,260	474
Grand Total	6,092	8,790	12,490	16,238	1,328

Basic Assumptions: 1. Final armistice before middle of 1945.
2. No chaotic postwar price inflation.

NOTES

1/ New construction in place as comparable with that reported by Department of Commerce. Includes no work relief or maintenance.

2/ Dwelling unit equivalent about 972,000 units.

3/ It is assumed that construction costs will average 30% higher, in the period 1947-1951, than the level obtaining in 1940.

4/ This estimate is predicated on resumption of building product manufacture, to replenish inventories, and resumption of civilian construction before the final armistice. It is also assumed that a substantial amount of private and public construction projects will have been planned in advance of the final armistice.

5/ Extension of Producers Council estimates to approximate the probable volume of electrical work to be handled by electrical contractors.

(c) Stabilizing labor relations toward the goal of full employment.

The plan sets up a group of general principles which are stated as follows:

Full Employment:

1. The principal goal of a planned economy is full employment. To do this, national income will have to be maintained at a figure of 150 billion dollars a year, and at least 13 or 14 billion dollars a year would have to be spent on construction, with possibly $1,300,000,000 on electrical construction.

Flow of Capital:

2. The flow of money is the key to the new economy. With vast savings pent up in banks, there will be a vital contest between services for the expenditure of the consumer dollar.

Housing Program:

3. Housing will possibly play a weighty part in the postwar situation. If business is maintained at a level equal to the wartime effort after the war, it is apparent that housing will have to go forward at a rate from 8 to 13 billion dollars a year. It becomes apparent, therefore, that balance as between housing and other necessary activities will be one of the main problems facing the United States in the postwar world.

High Wages:

4. Wages should be maintained at a high level in the postwar world. This conclusion derives from the general economic theory that workers in a 150 billion dollar a year economy must have the wages to buy back the goods that are produced. Deeply intermeshed with this conclusion is also the question of the colossal savings that will have accumulated during the war lying in banks and in the hands of individuals, totaling many billions of dollars. These billions are potential consumer funds ready to buy attractive goods. Competition will arise not so much between segments of an industry as between industries competing for the consumer dollar.

Removing Barriers:

5. In reviewing prospects for postwar construction the NECA-IBEW plan sees a serious dislocation of business if the immediate postwar period is as poorly planned as 1918. However, it points out that the possibilities for prosperity once the United States has made the peacetime adjustment are great, giving the following estimates:

The estimated postwar goal of 12½ to 15 billion dollars annually for both public and private construction will provide employment for an average of 2½ to 3 million workers in direct construction operations. So great is the need of construction workers if this yearly output is maintained, that the question naturally arises, where shall they be acquired? Moreover, it is apparent that about 3,750,000 to 4,500,000 workers will be needed to produce the lumber and the construction materials, the machinery and equipment needed to maintain such an annual output. In short, the construction industry appears to be destined for tremendous expansion, totaling perhaps 7,500,000 workers in its ranks if postwar full employment is maintained. On this basis, it would seem that an estimate of 250,000 skilled electricians is not too much to expect as the normal load to be carried by the electrical construction industry. This at once suggests a reemphasis upon apprenticeship training by this industry at this time at full force to continue supplying the expected load. And it means the re-training of many specialists produced under wartime conditions to make them all-around journeymen.

Rehabilitation

There is now a great backlog of repairing and maintenance work to be done. Changeover from cheap wartime installations to permanent peacetime installations is needed. There is an accumulated obsolescence in existing works and structures. Another factor in the situation is the export demand for production materials, machinery and equipment. Immediate relief, rehabilitation and reconstruction operations in the occupied countries will be a necessity if the world passes to some normal basis. Inevitably there will be brought forward many new types of construction. The electrical construction industry must make its adjustment to these newer types. It is to be hoped that architects and engineers are already making plans to meet the heavy consumer demand.

The National Resources Planning Board recently reported a backlog of federal construction projects totaling more than 7½ billion dollars. This is a backlog that can be held in reserve to be thrown in at that moment when production lags.

Economists in the United States Department of Commerce foresee in the housing field alone a vast replacement program ahead. According to the census, this report says, as late as 1940 more than 10,000,000 village and urban dwelling units in the United States needed major repairs or lacked private baths. Nearly 5,000,000 units are of such condition that they may be classed as hovels and should be demolished as being unfit for living under decent conditions. If 5,000,000 dwelling uni should be replaced, potential constru tion outlay of between 20 to 25 billi dollars would be required. While the houses are being replaced, it must borne in mind that our population growing at a rapid rate, probably at t rate of 400,000 to 500,000 families year. New dwellings will be needed f these new families and this represen an outlay of perhaps 2 billion dolla annually. The wearing away of hou values will demand possibly 350,000 a ditional units a year. It is not too mu to suppose that a normal housing ye in the future would accumulate 1,500,0 dwelling units annually.

Behind this necessary housing pr gram lies, of course, auxiliary progra such as need for new water supply a sewerage systems, new hospitals, ne school houses, new libraries, new co leges, new highways and better stree In the face of such wants, the constru tion industry need only look forwa with confidence if it properly girds i self to play a proper part in this gre national expansion of the industry.

Annual Income for Mechanics

In recommendations regarding labo stabilization, the committee has asked th industry to consider the introduction o an annual income basis of paying em ployees. Urging that the plan be tri out on a local basis by well establishe contractors in cooperation with the local unions, the committee suggests th if the plan proves successful it wou be easy to pass on to the annual in come form of payment on a nation scale.

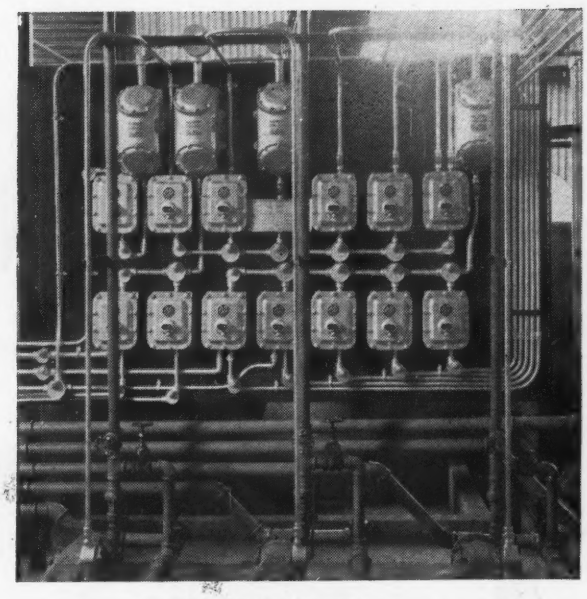
In national planning as well as local activities there remains much be done. Many working committees a just now being formed. The NEC plan is but a preliminary report. But start has been made and broad outlin have been drawn.

And one of the most hopeful porte of all, in the interviews and co respondence that contributed to th study there was a persistent emphasis the need for close, harmonious indust cooperation in the development of th postwar market. In the great oppo tunity ahead it is essence of sound pla ning to coordinate our various indust motivations toward better living throu the products and service that the seve segments of the electrical industry c provide. And the road is broad enou that all may travel abreast.

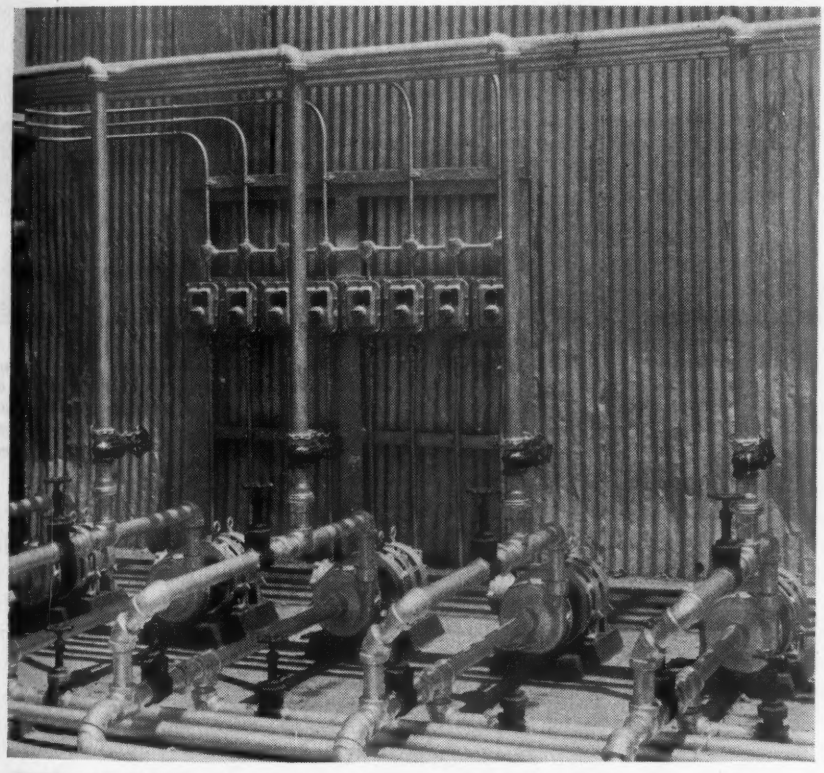
The war must still be won, and t peace secured. But forthright planni can help create the world tomorrow.

TIPS On Explosion-Proof WIRING

Careful workmanship and emphasis on proper sealing of circuits highlight the "know how" of explosion-proof wiring



***SEALING FITTINGS** are prominent in the conduit work on this built-up explosion-proof power panel in a southern industrial alcohol plant. Installed by the Walter J. Barnes Electric Co., New Orleans, the panel contains main circuit breakers which feed groups of motor starters.*



***OUTDOOR BANK** of explosion-proof motors starters feed a group of pump motors in the same plant. Note sealing fittings on conduit at starters.*

THERE is no satisfactorily safe substitute for the conventional explosion-proof wiring system in hazardous locations. Hence we find such equipment and its attendant wiring being installed in the numerous high octane gasoline refineries, alcohol distilleries, and other Class I locations where flammable volatile liquids, highly flammable gasses, mixtures or other highly flammable substances are manufactured, used, handled or stored.

Such systems must, of necessity, be perfect with respect to design and installation. Choice of improper equipment, careless and indifferent workmanship cannot be condoned. The slightest defect in the system may mean not only a temporary power shutdown, but loss of life and plant through an explosion directly traceable to electrical origin. Manufacturers have provided the equipment and the National Electrical Code has provided the regulations for its use and installation. It is the contractor's responsibility to install the system in accordance with those rules; and the inspector's job to enforce those regulations to the letter of the code.

Contractors like Walter J. Barnes of New Orleans, who through specialization in this field have developed a valuable background in the "know how", have a few valuable tips for those who have yet to figure or are just doing their first explosion-proof job. These include:

1. *Know the Code*—Article 500 of the National Electrical Code covers installation of electrical equipment in hazardous locations, giving precise definitions of the various classifications of hazard, the type of equipment, and rules for installation and grounding.

2. *Know the Equipment*—Numerous manufacturers have on the market explosion-proof motors, switches, controllers, conduit fittings, circuit breakers and lighting units (both incandescent and fluorescent). The contractor must keep up to date on the latest developments in this equipment and must know where to use each type. He should stock smaller accessories to expedite starting of jobs.

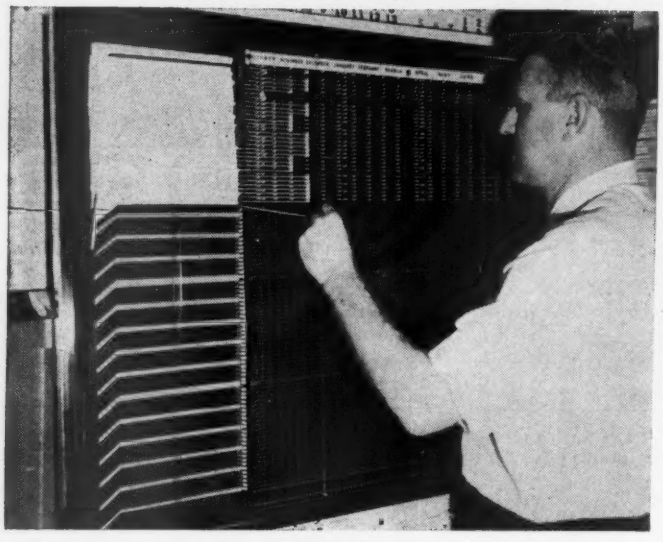
3. *Careful Design*—The actual installation "know how" is generally left to the contractor. Plans and specifications usually specify the type of equipment with the clause "installed in accordance with the N.E.C." When and where to use sealing fittings is an important phase of the contractor's knowledge. His guide is section 5014-b of the Code which definitely states that conduit runs shall be sealed off with approved fittings:

a. Where conduit terminates in an

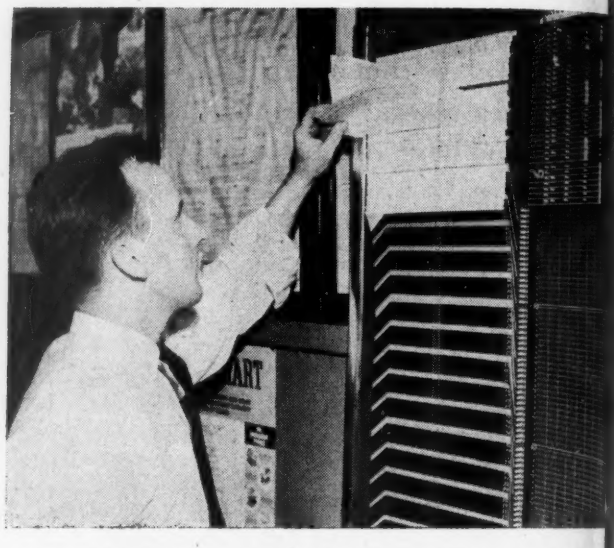
[Continued on page 147]

Control Board Directs MAINTENANCE SCHEDULING

Colored pegs mark deadline and order specific maintenance procedures.



CHAS. G. MARSHALL, chief engineer for Philip Morris, saw immediately the great possibilities of such a board as applied to his scheduled maintenance program. Here he holds one of the tape pegs which denotes that all tasks, to that particular point, have been performed.



WORK ORDERS are issued daily by the maintenance office clerk. The cards carry all pertinent information on equipment including nameplate data, test results, dates, etc. Only a portion of the board is in use now on an experimental basis, but soon all space will be completely utilized.

SCHEDULED maintenance for the purpose of preventing unanticipated breakdowns has been rigidly enforced for years at Philip Morris and Company's cigarette manufacturing plant in Richmond, Virginia. The maintenance itself was not the severe problem at Philip Morris but the matter of assurance that all equipment had been inspected and serviced was, until recently, the great difficulty.

Chas. G. Marshall, chief engineer, was approached recently by a representative of the Productrol board on its application to tabulating production quotas. However, production was not the problem that Marshall was most concerned with. His contention is that if maintenance keeps out in front, production can't help but follow. So with almost no consideration of the price, he bought the board on the spot for his maintenance scheduling program. He saw immediately its tremendous value for this purpose—hang the cost. Productrol's man was astounded. Of the many boards sold before, this was the first to be applied to maintenance.

Anyhow, what Marshall saw in that board was a solution to his sleepless nights. Here was something he could stick right up in front of his face. A card file is fine for keeping records, but when the drawer is shut—"out of sight out of mind"; whereas a date line on this board would show up uncovered pegs that meant either certain equipment *had* or *had not* been inspected or serviced and this was what he wanted to know. The uncovered pegs stuck out like a row of sore thumbs.

Description of Board

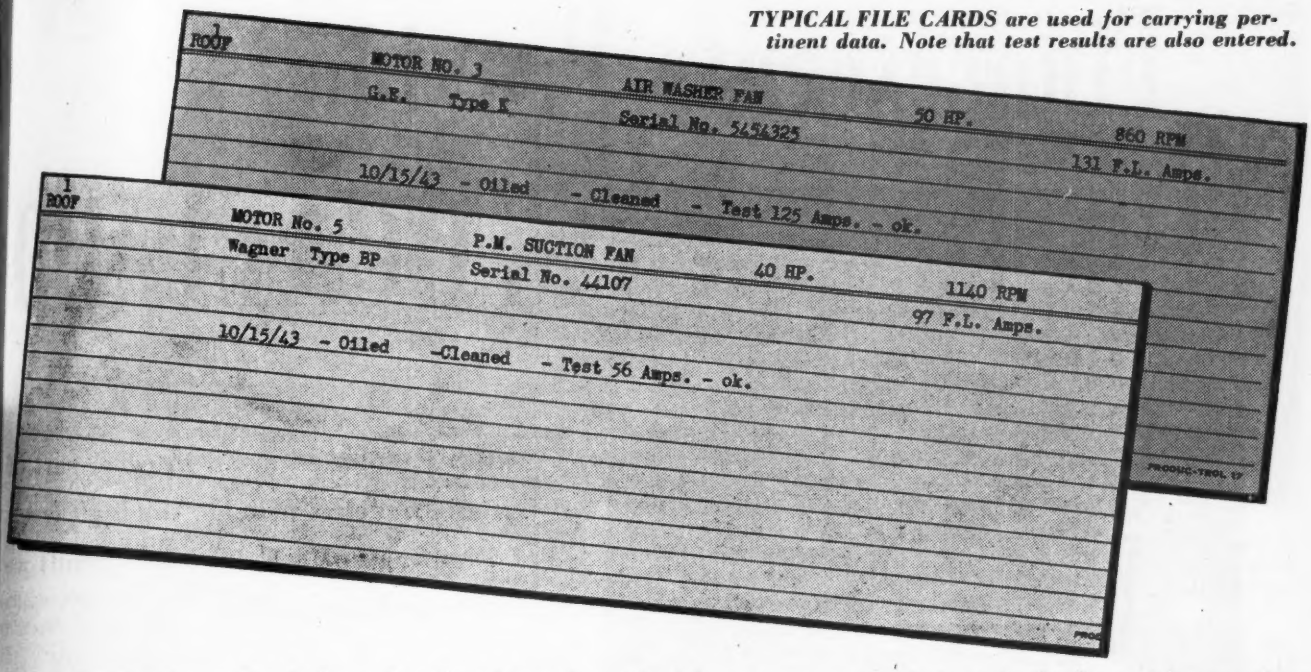
Briefly, this is how the board has been adapted to the Philip Morris maintenance program.

The general appearance of the board can be seen in the accompanying pictures. On the left is a file of cards with a total capacity for 100 separate filings. Each separate file is numbered to correspond with a horizontal column consisting of two parallel rows of holes. The files are held intact by a lucite strap and cards can be easily identified, inserted or withdrawn from the side (as in the picture).

Each separate file may contain as many cards as practical, giving the board unlimited capacity. The cards measure 9¼ inches by 3 inches to carry the pertinent information of the equipment.

The bulk of the board is to the right and contains many, many vertical and horizontal rows of holes to accommodate the pegs. Thousands of different colored pegs are provided to indicate various operations or conditions.

It will be noted from the pictures that each numbered horizontal row consists of two parallel rows of holes. Also note that alongside the file of cards is a vertical row of pegs, each with a string attached and each with a numbered head to correspond, both to the file number and to the horizontal row of holes. Thus,



***TYPICAL FILE CARDS** are used for carrying pertinent data. Note that test results are also entered.*

the various colored pegs for designated operations are inserted in the upper row, and the so-called "tape-peg" is placed in the lower row. The tape-peg can therefore indicate that designated tasks have been performed depending upon its position, as will be shown later.

A row of holes at the very top of the board and another at the very bottom provide a date-line that can be moved daily. Physically, the date-line is a string stretched between two pegs which are inserted in these upper and lower rows of holes.

The peg area has been divided into twelve equal vertical columns to represent the twelve months of the year, as can be seen in the pictures. Approximately twenty-two horizontal holes are allotted to each month giving an average of five holes per week.

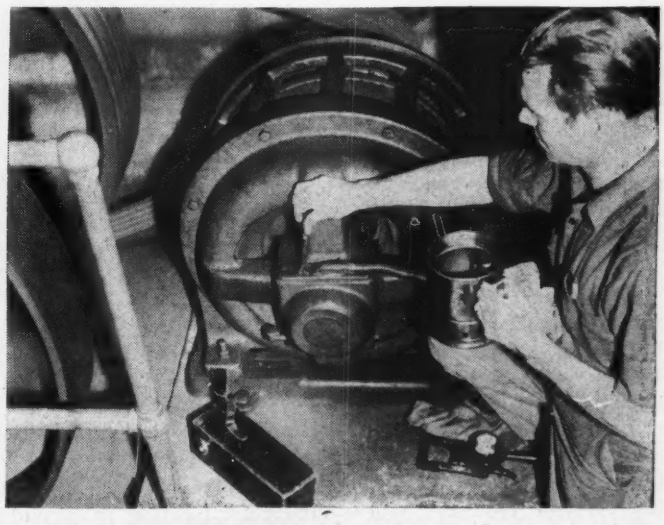
The various colored pegs are given specific designations, as for example: tan—dis-assemble and thoroughly clean motor; black—blow out motor and control; gray—change oil in gearhead only; blue—grease all ball and roller bearing motors; yellow—oil all sleeve bearing motors; green—wipe and inspect all contacts; etc.

Now, each file contains several cards (one for each motor and control) covering the equipment in a specific area or perhaps pertaining to a specific group of drives on a certain machine. The purpose behind this system of notation is that all the drive and control in this area is subject to the same conditions of dust and air contamination and in general to the same operational sequence. Consequently, one peg will suffice for the group. That is, clean one—clean them all; oil one—oil them all; wipe and inspect control contacts of one—wipe and inspect them all.

Now suppose conditions are such that the motors and control of the motors in groups one through ten should be disassembled and cleaned every two weeks, because of the vapor-laden air which precipitates a gummy substance that adheres to both stator and rotor surfaces. If allowed to go too long without attention, this coating sometimes completely fills the air-gap, causing friction and heat during rotation. It has even been

[Continued on page 140]

***CLAMP-ON TYPE METERS** are used to take the load checks. A gradual replacement of all over motored drives is expected to raise the plant power factor and the overall operating efficiency of the plant electrical drive.*



***VARIOUS COLORED PEGS** in the maintenance control board are used to designate specific maintenance procedures all the way from oiling and clean-motors to insulation tests and load checks.*

Fluorescents Provide LOCALIZED L

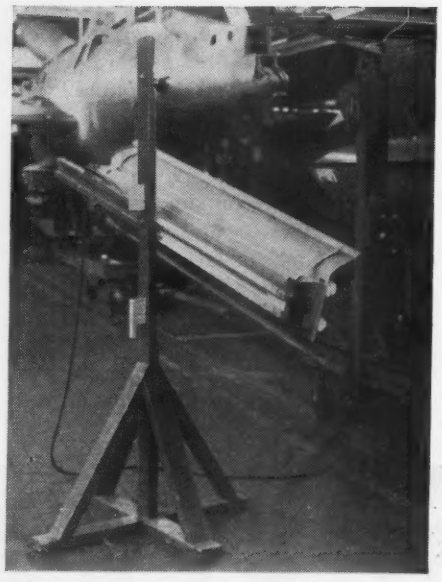
Fixtures mounted as an integral part of jigs and benches provide the high levels of illumination required in aircraft assembly and inspection.

***BENCH ILLUMINATION** is provided by fluorescent fixtures mounted as an integral part of the bench frame. Note drop cords leaving twist-lock receptacle fitting at ceiling. Fixture cord is plugged into a bench receptacle.*

PORTABILITY of jigs and benches is the keynote to the design of plant production facilities of the Eastern Aircraft Division of General Motors, Trenton, New Jersey. And along with this portability is the provision of an extremely flexible electrical distribution system. In addition to a well designed bus-duct network, the solution to the problem of illumination is noteworthy. Where equipment is portable and apt to be placed in any position (that most adaptable to the production procedure), it becomes quite a difficult problem to provide and maintain illumination levels required for close visual tasks such as aircraft assembly and inspection.

Localized Lighting

Localized lighting of some type is always required for close visual tasks regardless of high-level general illumination. Where precision operations are to be performed or where inspections are critical, a heavy concentration of lumens are necessary and can be provided only by fixtures mounted close to the working surface. However, where sufficient local light has been provided, the general illumination from overhead fixtures should by no means be neglected.



***PORTABLE FLUORESCENT STAND** that is adjustable both for height and position (that is, any angle between vertical and horizontal). These units provide localized light up-under the ship for final assembly operations.*

With these facts in mind, illumination design at Eastern Aircraft was developed and the results achieved were gratifying. Fluorescent units were used almost exclusively for general and local light. They have proven very satisfactory, especially in the case of localized lighting in providing a cool, efficient, evenly distributed and shadowless illumination at the high levels necessary for the work being done.

All work benches and inspection benches are portable and can be moved wherever convenient to fit the production requirements. In order to be worthy of the "monicker" portable, of course, their electrical outlets must be fed by cord and plug—and they are.

A network of conduit distribution is supported overhead. Receptacle fittings are spaced at regular intervals and are of the twist-lock type. Drop cords of sufficient length are provided and may be looped at the top to take up any excess. The drop cords go directly into a two-pole manually operated fusible switch which is mounted on the inside of the back leg at one end of the bench.

Circuits emanate from the switch and feed four separate receptacles. The benches are ten feet long and accommodate two workmen. Each has five feet of working area that is provided with two receptacles and one fluorescent fixture. The fixtures use two 100-watt 3500 degrees white tubes and are mounted at a height of four feet above the bench top. Three wood supports rise from the back of the bench and carry a horizontal wooden beam from which the fixtures are hung. Each unit is supplied with a cord and twist-lock plug which is plugged into one of the two receptacles provided for that working area. In this manner, complete fixtures can be replaced easily and quickly to be taken to the shop for repair. Also maintenance is facilitated in that reflectors can be lowered, cleaned, and placed

ED LIGHTING

back in service much more rapidly than if they had to be cleaned while in place. Notice in the photographs showing bench illumination, how protection is obtained against dropping tubes. To prevent accidents it was necessary for plant electrical engineers to devise some scheme for holding tubes in place. Three thin narrow strips of spring steel of the right length were snapped into place, one at each end and one in the middle. Crimps in the longitudinal edges of the reflector provided the end supports for the strips. Spring-tension from bearing against the under side of the tubes, keep the ends of the strips securely in place in the crimped edges.

In addition to this local lighting, an abundance of general illumination is provided by incandescent light in some cases, and in other instances by fluorescent ceiling fixtures.

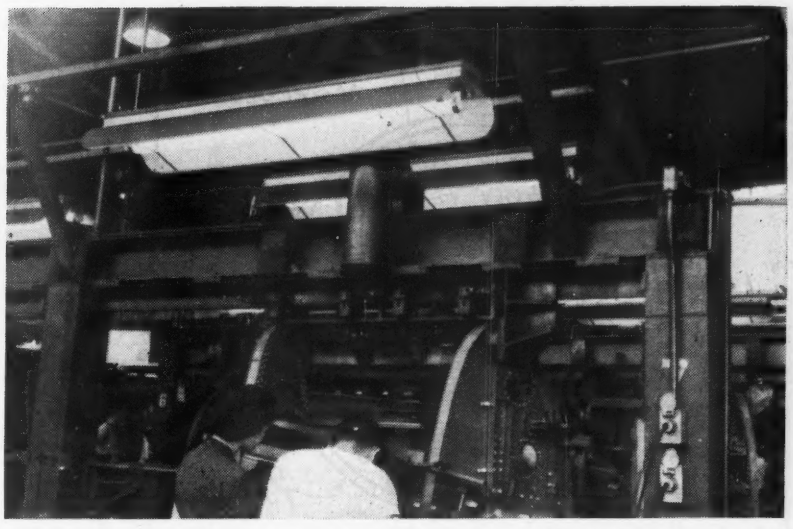
Wing Stub Jigs

The jigs in which wing stubs are assembled, are large, heavy frames built of structural steel. Each frame has a capacity for two wing stubs which may be worked on from either side as in the accompanying photograph. Atop the steel frame is mounted a wooden frame consisting of three V supports whose arms spread out and up to carry two parallel horizontal crossbeams. Four fluorescent fixtures are hung from the crossbeams to provide local light on each side of each wing stub assembly.

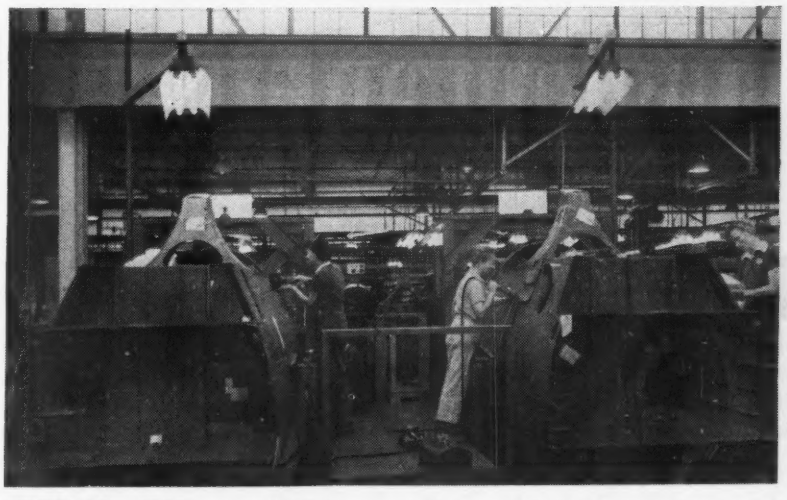
The fixture cords in this case do not use plugs, but instead are provided with pull switches mounted in the four-inch junction boxes. Two 100-watt 3500 degree white tubes are used in each fixture which is mounted about four feet above the average working plane. The many crosspieces, indentation and protrusion of parts makes shadows inevitable. However, using fluorescents as a local source, gave the most satisfactory solution to the problem.

Electrical distribution to receptacles for hand tool use is accomplished by a permanent conduit installation on each

[Continued on page 142]

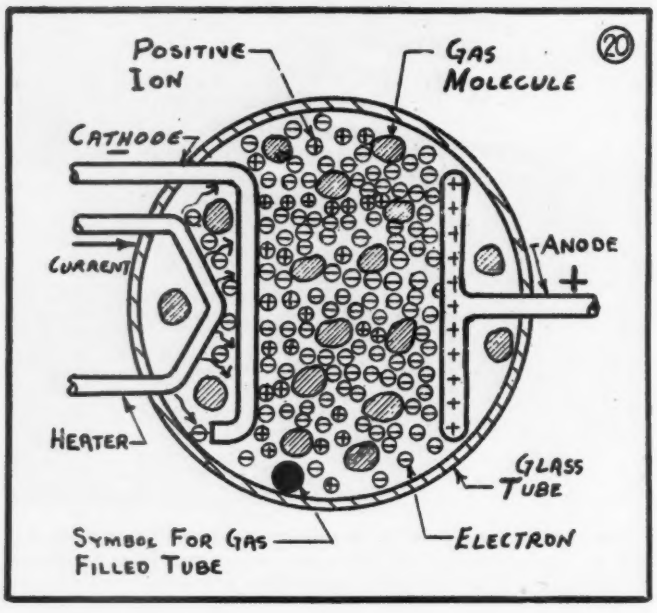


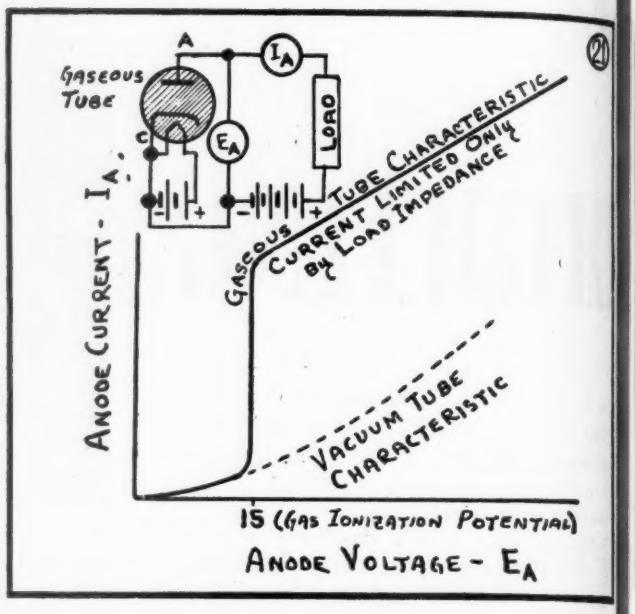
***WING STUB JIGS** are provided with ample assembly illumination by localized lighting fixtures mounted on jib superstructure. Note the three thin spring steel strips used to hold fluorescent tubes from dropping out accidentally.*



***FUSELAGE JIGS** are lighted by a swivel-mounted fixture on the end of a revolving boom. Illumination is provided here primarily for the workmen (or workwomen) who do fabricating or assembly operations within the body of the ship.*

***PLENTIFUL GENERAL ILLUMINATION** is provided by overhead installations such as above. In this way, contrast is reduced to a minimum. Local units provide the extra foot-candles of light necessary for the particular operations classed as close visual tasks.*





Fundamentals of ELECTRONIC T

IN the previous articles we have discussed vacuum tubes in which the space through which the electrons flow is exhausted of all gases. If, however, a small amount of an inert gas is introduced into this space, currents of a higher order of magnitude are practical.

3. GASEOUS TUBES—THERMIONIC EMISSION

A. *Two-element Gaseous Tube—Phanotron*

In a gaseous tube a filament or cathode is used to emit electrons similarly to the element in the vacuum tube. The molecules of the inert gas completely fill the tube and as an electron usually travels with an enormous velocity from the cathode to the anode, it is very likely that the electron will collide with a heavier and slower moving molecule. A gas molecule moves approximately 1/600th as fast as an electron. The molecules are often struck by the electrons with such force that one or more electrons are knocked out of the molecule. The newly created electrons will travel toward the anode and may, in turn, set other electrons free and considerably increase the electron current during their transit to the anode. The molecule after losing an electron is no longer neutral and is known as a positive ion as it is positively charged. Fig. 20 illustrates that more electrons reach the anode than leave the cathode when the tube is first operated.

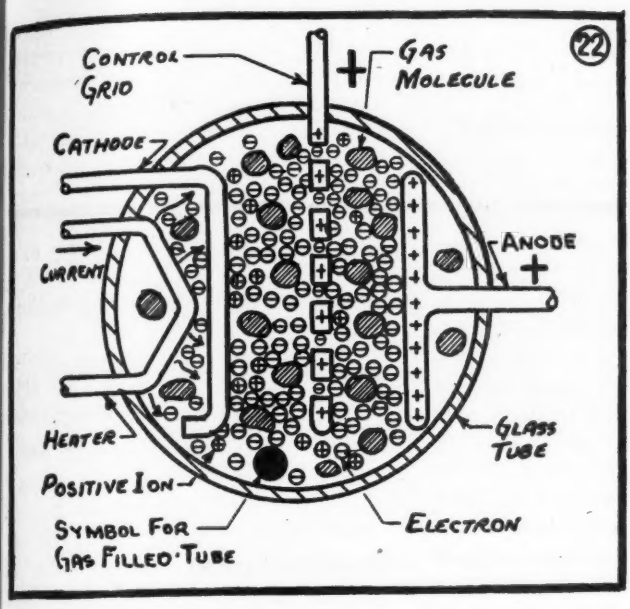
These positively charged ions will be attracted by the negatively charged cathode and will neutralize the space charge between the electrodes. This is accomplished as a positive space charge which is approximately equal in magnitude to the negative space charge produced by the ions. The resultant space charge approaches zero and the current to the anode is limited only by the load impedance. The gas in the tube may be completely ionized in approximately a microsecond and as the tube resistance is very low, a current flow of large magnitude may be accomplished almost instantly. The gaseous tubes utilize two electron emission methods; thermionic emission and ionization by collision.

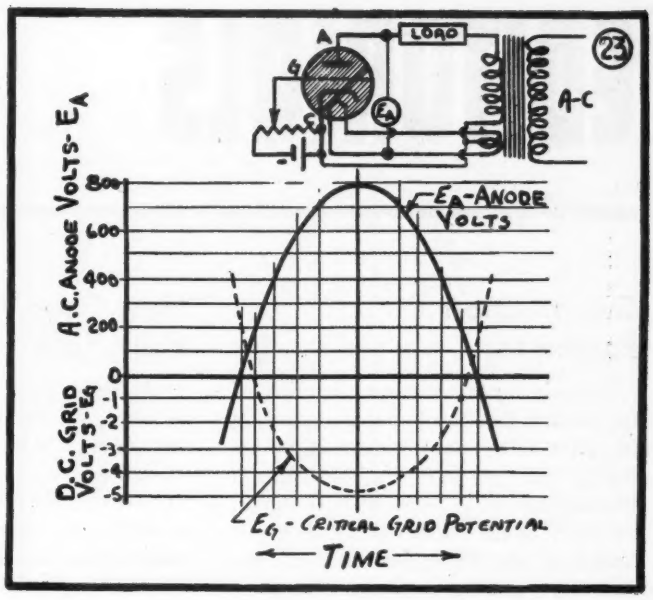
The mercury vapor diode tube characteristics are compared to those of a vacuum tube in Fig. 21. At very low voltages as shown by Fig. 21, the anode current I_A increases with an increase in anode voltage E_A in the same manner as in a high vacuum tube. However, at some critical potential which is slightly in excess of the gas ionization potential, the full cathode emission current may be obtained with little or no increase in anode potential. This type of tube finds wide application as a rectifier as it conducts only when the anode is positive. Similar to a diode vacuum tube, it will not conduct current when the anode is negative. For full wave rectification the tubes are sometimes built with a filament or cathode and two anodes in the same tube. The operation of this tube is equivalent to two separate diode tubes. Either the half or full wave gaseous tube is known as a *phanotron.*

Since the ions eventually fall into the cathode, the voltage drop across the tube must be maintained below a certain maximum and critical value or the voltage will accelerate the ions to a velocity high enough to disintegrate the cathode. The ionization potential of mercury is 10.4 volts and is the lowest voltage at which ionization will occur. The cathode is rapidly disintegrated and permanently damaged when the tube drop exceeds 22 volts. Tubes of this type are frequently operated with approximately 15 volts potential between the cathode and anode. At this and voltages less than 22 volts, the cathodes have a very long life.

Hot cathode mercury vapor tubes should always be operated within a definite temperature range as the temperature determines the mercury vapor pressure. When the pressure is too low (low operating temperature), the voltage required for complete ionization exceeds the voltage at which cathode disintegration occurs. When the pressure is too

[Continued on page 144]

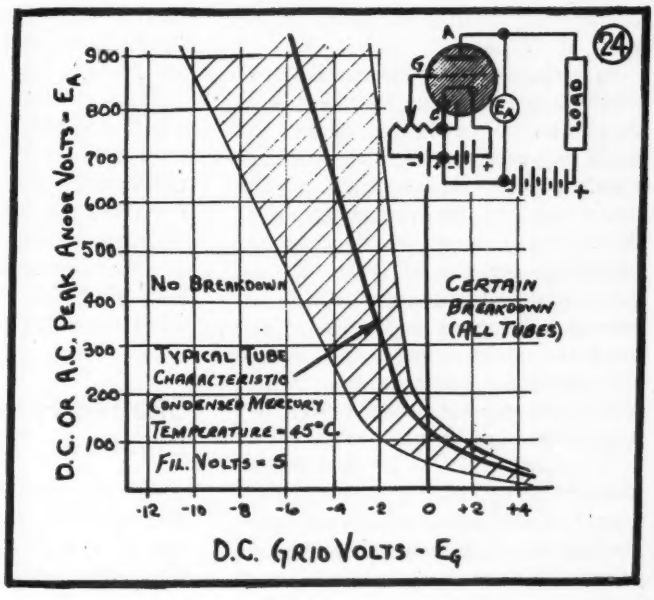


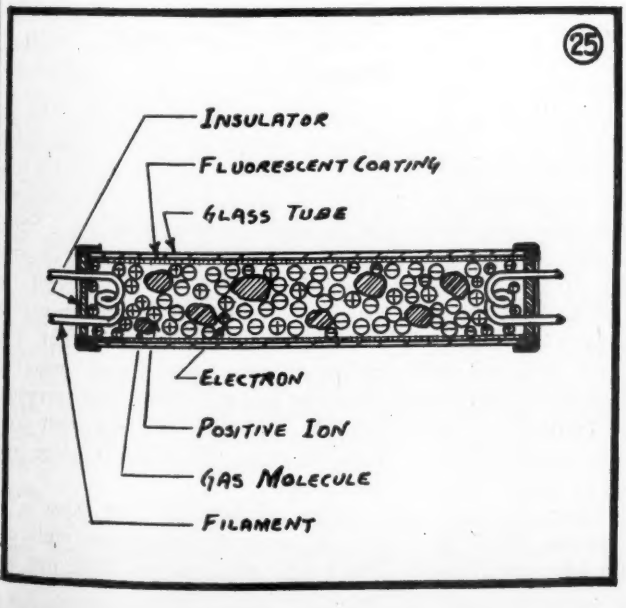


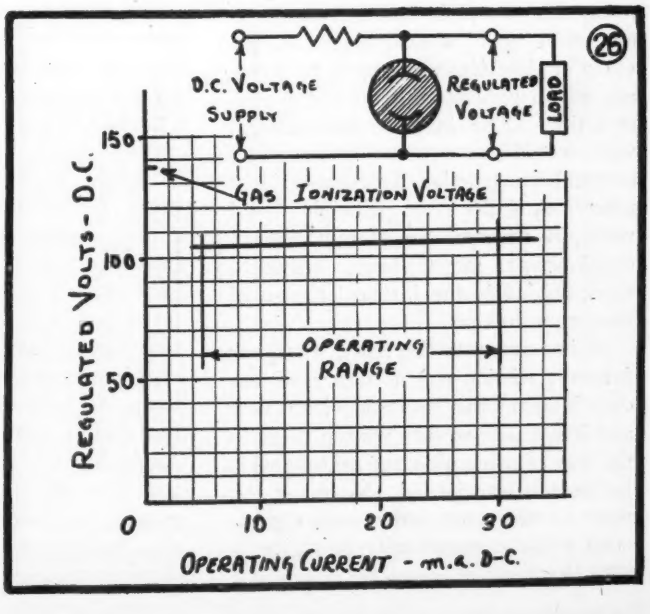
TUBES . . No. 3

Continuing the series on the operation of electronic tubes, this installment takes up the characteristics of the gaseous type of tubes.

By Ralph B. Immel
Control Engineer
Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.







EDITORIALS

W. T. Stuart, *Editor*

Construction Forecasts

Underlying the postwar planning of the electrical contractor is the question of what course the construction industry will follow in the days ahead. One authoritative forecast based upon the work of the Market Analysis Committee of the Producers Council, the national organization of manufacturers of building materials and equipment, is summarized in the lead story "Postwar" in this issue.

In using construction statistics in our own planning and thinking it is important to emphasize again and again, however, that the course of electrical work is in the direction of a larger share of the construction dollar through (1) increased lighting and utilization per unit of space or area, (2) closer relation to function, (3) improved lighting as an inevitable element of modernization, and (4) rapid technological improvements which create new jobs for electric power such as refrigeration or television.

A major weakness of construction statistics as an index to potential electrical business is that they do not reflect the effects of industry promotion in specific fields such as industrial modernization or residential lighting. Sound adequate wiring and lighting promotion through full industry cooperation could conceivably run the value of electrical work up to an average of 10 percent of total home construction. The increase in electrical work would be enormous but the effect on total construction figures relatively minor. And the same principle would work in reverse. Indifferent market development might leave electrical work behind in the forward course of total construction.

It is apparent, therefore, that our future statistics are a matter of our own industry boldness and vision now and how much we are willing to do in the way of promotion and salesmanship in the postwar period. No other element of the construction industry has such a clear opportunity to write its own ticket.

New Code For New York

Back about the time we were running behind the local gasoline buggy shouting "get a horse", New York City passed itself a municipal electrical code. If its writers had known what they wrought on that immortal day they would have insisted that their portraits be steel engraved on the document as a memorial to their efforts. It was to persist for thirty years, collecting amendments and bulletins as time marched on.

A few weeks ago, the mayor signed a new streamlined job known as Title B of Chapter Thirty of the Administrative Code of the City of New York. It follows the 1940 National Electrical Code. It includes an article on fluorescent lighting installation. It will go a long way toward simplifying code administration in the big town.

Shaped Fluorescents Planned

Announcements by two of the leading manufacturers just before the first of the year told of plans for circular fluorescent lamps in 20, 30 and 40 watt sizes, outside diameter, 8½ inches, 12¼ inches and 16 inches respectively.

No production facilities have yet been made available and it is evident that the preliminary announcement is for the guidance of architects and designers who may include the new lamp in their postwar plans.

Shapes in fluorescent lamps offer many possibilities for adaptation to special fixture designs, however, the linear source that fluorescent lamps gave us is functionally suitable for so many jobs that it is to be hoped that too much design emphasis on special shapes approaching the incandescent lamp will be avoided. Even if fluorescent lamps could be installed in any socket it would be a questionable blessing. It would probably do more to perpetuate bad luminaire design and spacing, inadequate illumination and a lot of other mistakes of the long past, than it would contribute to lighting development.

Our best wishes for the new circular shapes but let's keep our new light source in distinct and different forms from the still available and still useful incandescent lamp.

Bookkeeping Made Easy

On a monumental job of laying out simple, sensible and uniform methods of bookkeeping for members of the National Industrial Service Association, Frank Willey and Selden High of Cincinnati have just released the summarizing chapter. The series is now in the process of editing and modification in line with suggestions which have been made during the course of its preparation.

Such a job as this rarely receives the recognition that it deserves, but it is a well known business axiom that money can be saved through modern accounting and bookkeeping methods as well as through modern shop methods.

NISA has done well to sponsor this activity, but special credit must go to the committee members who turned out a very thorough job.

Save and Salvage Paper

Rather than issue specific curbs on paper use which would work real hardship on many businesses, the WPB has asked us all to enlist in a voluntary paper conservation program. Such saving will insure the supply of war production needs and prevent a crippling overall cut in civilian paper.

Paper is a business essential, for correspondence, advertising, records, wrapping and packaging, and everyone uses it. And the most important savings are those which do the same job with less.

Using substantially less paper is a test of ingenuity and resourcefulness. But a real start can be made just by

keeping the problem in mind every time you write a letter, set up business forms or prepare advertising material.

On top of conservation in use, tons of valuable paper can be recovered by intensive salvage. Handle waste paper so that it can be readily bundled. Get it to your local paper salvage station. It is vital material.

For Intelligent Machine Operation

We like the yarn of the electric motor control expert who built an automobile. He installed intricate protective devices to guard the motor from harm. If the water in the radiator ran low, or the hill was too steep, or the speed too fast, or the oil down or the battery low, it cut off the ignition. It was all very simple and foolproof. Since the engine was fully protected and would automatically stop if there were trouble, there was no need to know anything about its operation. Consequently there were no instruments to guide the driver.

Identically, the same fallacious reasoning in electric motor application we accept as standard. If the motor stops on overload our work is done. Or if it stops too frequently, and ties up production of a few thousand dollars worth of goods, we install a larger motor and bigger overcurrent relays. Yet the idea of giving the machine operator a small panel so that he can exercise intelligence in its operation is so rare that it is practically never considered in ordinary motor and control applications.

Why? I think it is a simple case of compartment thinking, instrument makers concerned with instruments, motor and control manufacturers concerned with improvement of their products, and machine manufacturers concerned with like details. It is pretty much up to the man who installs the apparatus to put the heat on all so that we may have simple and inexpensive instrument panels, either as a part of motor control apparatus or as distinct equipment available as standard apparatus.

Motor installations should have the best possible protection, certainly. We have an equal responsibility to provide means for intelligent machine operation. The necessary data is in the motor circuits waiting to be reported, not occasionally, but continually, by permanently installed electrical instruments.

Quality Doesn't Just Happen

The laboratory facilities of one of the leading wire manufacturers recently gathered themselves together in new quarters under one roof. We were invited to inspect the building and see something of the laboratory background of insulated wire. The intricate chemistry and metallurgy, the delicate process control and the rigorous testing that go to make electrical conductors are impressive and thought provoking. It is the solid foundation of our great technical industry.

All of the research, from the persistent reaching out for new facts to the carefully controlled manufacturing methods, winds up as wire which we take pretty much for granted. The "quality" of the product, a word we all use rather glibly, got there by everlasting research and painstaking improvement of details.

And out of the pressure for specialized war products such as high frequency cable or cold resisting insulation, laboratory work on insulated conductors has shot years ahead. Our postwar electrical contracts have already started in the test tubes and retorts of wartime research.

War End Speculation

A good friend and most useful critic commented the other day on our use of the opening paragraph of Washington Notes to report speculation on the war's end. Isn't it out of harmony, he asks, with the straightforward, how-to sort of information one expects in *Electrical Contracting?*

It is a fair question. The only men who actually know the timing of the basic military plans which will bring the war to an end are not talking. The source of our comment must be speculation. But a round-up of speculation in the complicated Capitol maze is probably as close to fact as any speculative forecast can be.

As for the importance of the subject, there is no other future event so definitely vital to the interests of, not only our nation, but of our industry specifically. Thus, in our opinion, any information, no matter how meager, that might help to guide thinking and preparation for the war's end is useful to those who read these pages. We hope it will be accepted, as the indistinct backdrop of the Washington scene.

Washington Notes

▶ Great events are predicted momentarily, bearing directly upon the length of the war. Speculation is abundant that the news will be good. Meanwhile the official warnings persist that this is no time for optimism.

▶ More motors will be available for orders rated AA-5 or higher but without certification. Purchasers, however, must have no idle equipment adaptable and must make an effort to obtain used motors.

▶ Men being released from the armed forces at the rate of 70,000 per month are helping the manpower situation, but father draft will go on, digging deeply into the present supply of men. Actual total shortage will continue, although apparent labor surplus conditions may occur as programs change. Despite attacks, 1944 will call for about 20 percent more production than 1943. A total labor force of 66,300,000 is seen by July 1944. Construction workers released by decline will be absorbed by shipbuilding and aircraft plants.

▶ Reconversion will not be held up until the war is over. Present thinking of WPB officials involves three stages, (1) when a sufficient surplus of certain types of munitions is available, (2) when the war in Europe is won and, (3) when the Jap is sunk.

▶ Results of OCR's study of dire consumer needs will be acted upon promptly. Many were surprisingly simple, like steel wool. Electric irons and other appliances may soon be available again in limited quantities including 64,000 domestic electric ranges.

▶ Average construction rate in 1944 is estimated at about 33 percent of 1942. The 1943 program was 69 percent of 1942.

The 24,000,000 ton goal of new ship construction for the past two years has been substantially exceeded, according to a report by Rear Admiral Howard L. Vickery.

▶ WPB is studying all steel orders with a view to removing unnecessary restrictions on civilian production, two major aluminum plants planned won't be built. Materials generally are easier.

Inventories of fabricated articles and components hanging from modification or termination will move into regular trade channels.

BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

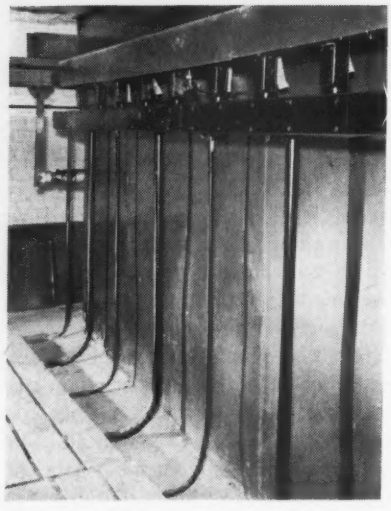
PRACTICAL METHODS

WIRING TROUGH FACILITATES FURNACE INSTALLATION

WIRING

To speed up installation when shipments began getting bad, Phil Caminiti, plant electrical engineer for Brewster Aero Corp. of New York City, resorted to the use of custom-built wiring troughs for each new job. The result has been an extensive saving in steel conduit. As soon as a job is laid out to the extent that dimensions can be obtained for lengths, and number and sizes of wires, an order is sent to the sheet metal department for a certain length of trough of the required cross-section. The trough is made up from thin-gage sheet steel with a cover drilled every twelve inches on each edge. Edges are extended inwardly on the open side of the trough to enable drilling and tapping, so that the cover can be fastened securely with stove-bolts.

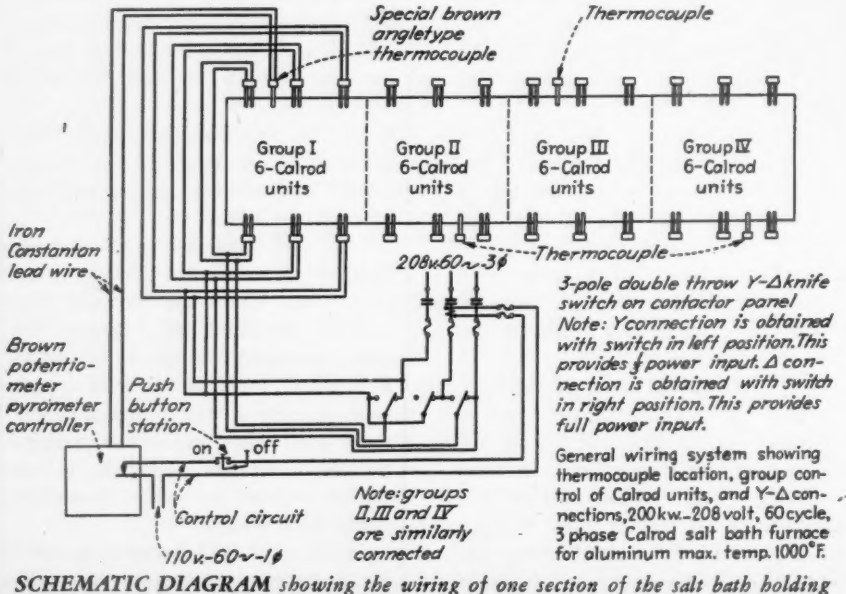
A typical installation of this wiring trough is in connection with a salt bath holding furnace for aluminum heat treating. The furnace is divided into four sections, each section furnished with six calrod units (three each on opposite sides) and one thermocouple. The wiring is according to the accompanying diagram. By throwing a ring of wiring trough around the furnace, the actual wiring job was considerably simplified. The four contactor panels (one for each furnace section) were mounted on the building wall about four feet from the furnace. Conduits carry the circuits down to the floor, across and up into the wiring channel as shown in the photo. Wiring channel was also used to carry distribution circuits to, and connect the four main panels.



***CUSTOM-BUILT** wiring channel carries the numerous calrod circuits for this aluminum heat-treating furnace. Conduits from main control panels enter at bottom of trough and condulets emerge from atop carrying connecting leads to calrod terminals.*

Another feature of the installation is the provision of a double-throw switch to allow the load to be reconnected from wye to delta or vice-versa. Each section is separately controlled by a pyrometer potentiometer which automatically maintains the preset temperature as indicated in the accompanying diagram. When bringing up the temperature initially, the furnaces can be manually set to wye connection with one-third power on, so as not to burn out the calrod units. Once up to temperature, and

***MAIN CONTROL PANEL** in which is located the magnetic circuit breaker and the manually operated wye-delta knife switch. Start-stop button and safety switch for 120 volt control circuit is mounted on side of each panel box. The small conduit below carries the pyrometer circuits.*



***SCHEMATIC DIAGRAM** showing the wiring of one section of the salt bath holding furnace. The three-pole double throw knife switch is used for wye-delta reconnecting. Because of the number of wires entailed in the complete installation, wiring trough is used to encircle the furnace carrying all the circuits.*

Declaration for Independents

IN our field, independent jobbers have made important contributions to the war effort. At the same time, despite the handicap of restrictions, they have maintained an adequate service of civilian supply.

This record of achievement is vital in the planning of a program of postwar expansion for Sylvania as an independent in electrical goods manufacture. There will be many more and different Sylvania products than ever before — products to sell to the home, to commerce and to industry.

War assignments increased Sylvania's 1942 production 57% over that of 1941 — and production for the first nine months of 1943 exceeded that of a comparable period the previous year by 93%. This makes for greater strength and experience in research and manufacture.

When peace lifts the restrictions and expands operations, Sylvania, as an independent manufacturer, will look first to independent jobbers for a means of distribution. Working together to supply better things for more people, independents can and will develop markets for new and improved products to their mutual advantage.

This declaration for independents by an independent is made with full recognition of prewar trends in our business, but with confidence that there will always be a place at the top in the future.

"It pays to sell SYLVANIA"

☆ **SYLVANIA** ELECTRIC PRODUCTS INC.

EXECUTIVE OFFICES: 500 FIFTH AVENUE, NEW YORK 18, N. Y.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES, ELECTRICAL APPLIANCES

after the crystallized salts have become liquid, the 3-pole double throw switch reconnects the calrod heating units to delta which advances the power input to full on for maintaining automatically the preset temperature.

VIBRATING CONVEYORS

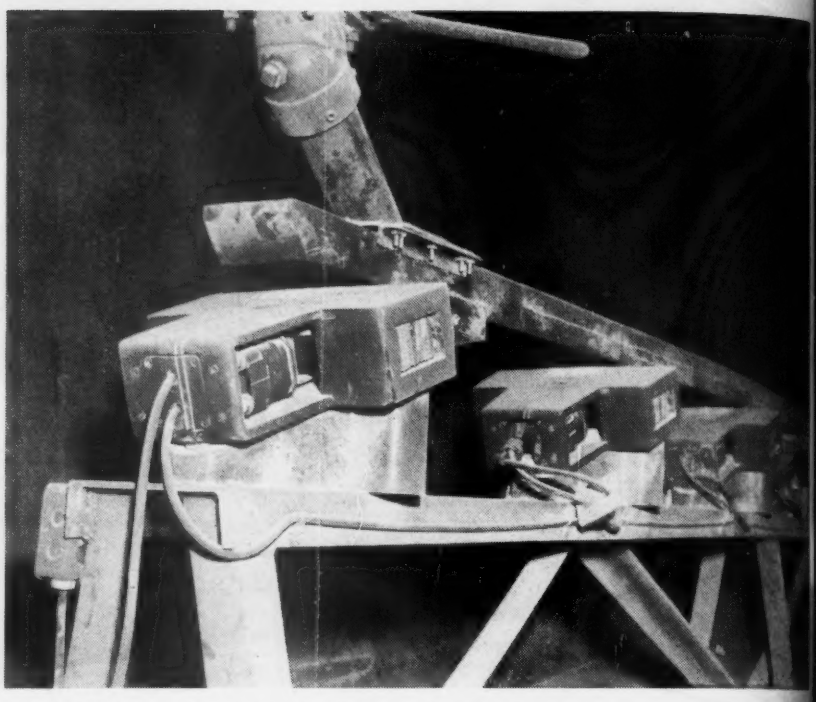
INDUSTRIAL

Magnetic conveyors have been developed for handling powdered material such as grains and flours. The conveyor chute itself is totally enclosed to eliminate dust and overflow. The chutes will carry material up or down with equal ease; they are particularly advantageous where there is low head room and not much elevation.

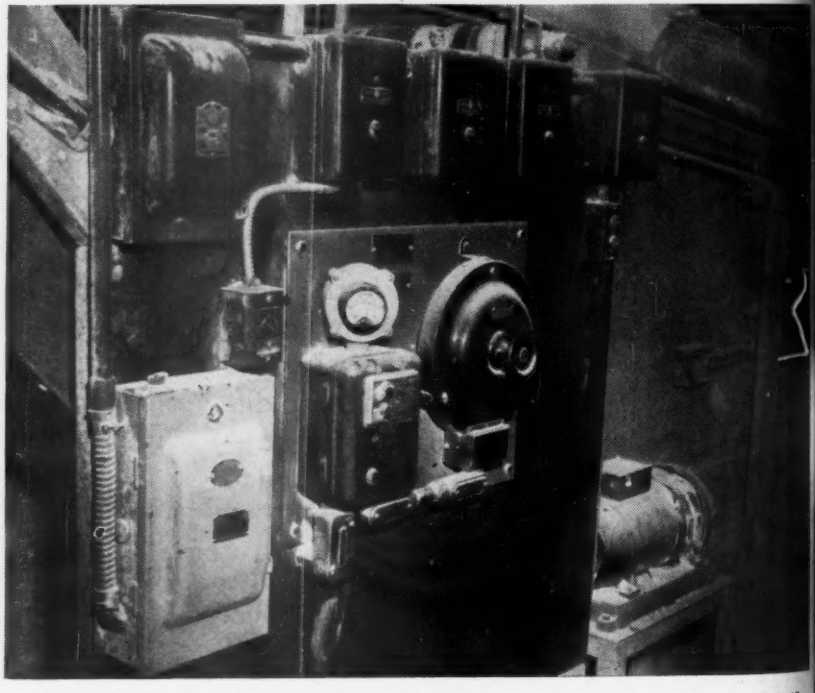
The Norton Company of Worcester, Mass., uses these magnetic conveyors for moving their abrasive grains from department to department. The mechanics of movement are very simple. As the armature of the magnet moves back and forth at the same frequency as the supplying current (i.e. 60 cycles in this case), the bottom of the conveyor chute is given a succession of light "kicks". This succession of "kicks" hops the material along at a rate depending upon the weight of the material being moved and the size and spacing of the magnets.

Stops are adjusted to the ears of each armature with a spring action applied to tend to retain it in a back position. Thus the stops and the spring action prevent the armature from actually hitting the field pole and damage to laminations is eliminated. To increase the intensity of and duration of the magnetic waves, (i.e. to amplify the "kick") 15 volt d.c. is superimposed on the 440 volt, 60 cycle power as in the accompanying wiring diagram. In this particular case, each magnetic unit takes about 1 amp. of 440 volt and 3 amps. of the 15 volt d.c. This value is of course determined by the design of the unit, but is however controllable by the d.c. generator field rheostat.

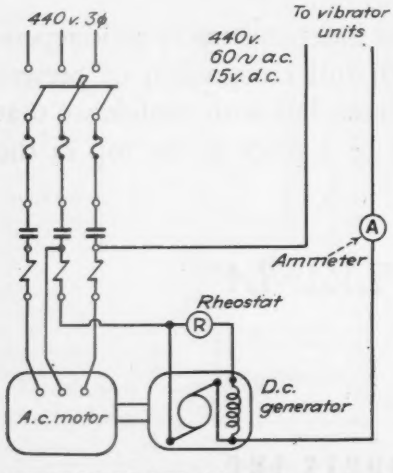
It was thought at first that considerable maintenance would be required in the repair of broken wire connections. However due to the extremely qu operation and special flexible conne tions, no trouble has yet been encou tered and maintenance is practical non-existent. In view of the absence belts, bearings and driving motors, it h a definite maintenance advantage ov the conventional type of conveyor. application is limited however to grai flours and like materials.



MAGNETS spaced on three-foot centers give the bottom pan a succession of silen "kicks" which hops the grains along the conveyor line. Material can be moved by thi means uphill or down.



MAGNET CONTROL for one section of conveyor is mounted on this panel. The rheostat is used for generator field control of the m-g set that can be seen to the righ of the panel.



WIRING DIAGRAM of the magnetic conveyor circuit. Direct current at 15 volts is superimposed on the 440 volt, 60 cycle current via the m-g set. In this manner, the intensity and duration of the magnetic "kick" is much amplified.

USERS GAIN IN MANY WAYS...

WITH AMERTRAN DRY TYPE TRANSFORMERS

EVEN in the best designed plants there are spots where costs can be cut and efficiency improved with AmerTran Dry Type Transformers. A step-down from your 460 volt circuit will enable you to pull out badly *underloaded* motors and utilize fractional horsepower motors as more efficient units for light work. Or you can gain the lower industrial rate for lighting. You can make your power circuits an economical source of low voltage for heating, heavy circuit testing, etc., by means of an AmerTran Dry Type Transformer.

AmerTran Dry Type Transformers are available for outdoor or indoor location. They are used for such applications as insulating circuits, balancing loads on three-phase systems, boosting line voltages and phase changing. A complete description of AmerTran Dry Type Transformers for these applications will be furnished upon request.

AMERICAN TRANSFORMER COMPANY
178 EMMET STREET · NEWARK 5, NEW JERSEY

AMERTRAN

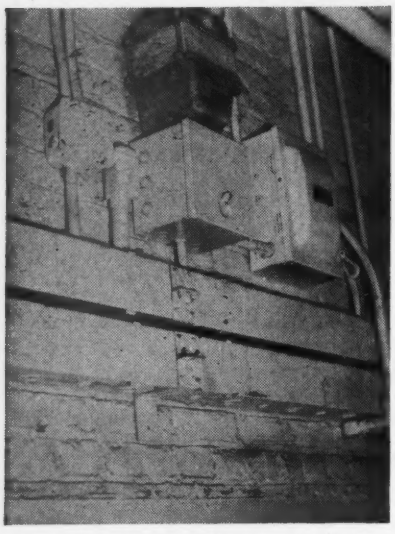
Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

BLACKOUT PROOF SERVICE FOR ESSENTIAL CIRCUITS

INDUSTRIAL

The conventional method of serving electric time clocks, public address systems, plant intercommunicating systems and low voltage electric instruments, is from the lighting circuits. However, under present conditions with blackouts likely to occur, such a design might cause trouble.

All of these necessary auxiliary circuits are fed from the power system at the Tool Steel Gear and Pinion Company plant in Cincinnati, Ohio. If a blackout occurs, pulling the main lighting breaker will not affect them. The underlying reason for this is that electrical instruments in the heat treating department must be in operation at all times and the public address system is used to direct plant activities during a blackout.



TRANSFORMER UNIT and double-throw switch assure continuous operation of essential low-voltage circuits during blackouts. Circuits are normally fed from power system through transformer. If power fails, circuits can be fed from lighting system.

Outstanding proof of the effectiveness of using the P.A. system for blackout instructions was made when the entire plant was blacked out and shut down from full operation to a dead stop in a period of 1¾ minutes. Similar speed in getting under way again was also evidenced.

Several 1½ kva., 220/110-volt, single-phase, double-wound transformers are used to feed these circuits from the power system. Each unit is equipped with a double-throw disconnect switch which in one position throws these circuits across the 110-volt side of the transformer and in the other, across the 110-volt lighting system. Thus, if it becomes necessary to kill the power circuit to make repairs or extensions, these auxiliary units can be kept in operation by feeding them through the lighting circuits. The normal switch position is on the transformer side and is changed only in case of a power circuit failure.

HINTS ON NON-METALLIC WIRING

WIRING

Recent experiences of Chicago electrical inspectors covering knob and tube and other non-metallic wartime wiring installations has led the Electrical Inspection Department of Chicago to issue the following installation suggestions to contractors doing this type of work.

Boxes and Covers—Only non-metallic boxes of approved design and type may be used. Non-metallic covers should be used on non-metallic boxes.

Box Supports—Outlet boxes for switches and receptacles should be securely fastened—a lath is not considered adequate support.

Conductor Supports — Supports for wires entering boxes should not be more than six inches from the box to hold loom securely and prevent wires from falling from the box. Other supports must be spaced not more than 4½ feet apart. Supports should be provided not more than six inches from and as close as possible to splices or taps and a tube provided if required to pass over ot wires.

Walls and Joists—To protect cond tors passing through walls that a thicker than the length of a single tu a tube of non-inductive material proper length should be installed w porcelain tubes inserted from each si and butting together within the non-i ductive sleeve. Tubes in vertical joi should be so located as to be protect from driven nails. When passi through plate of studding or floor, tube at least three inches long should provided to protect the wire from plas which drops through lath.

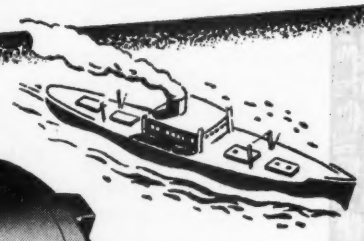
Conductor Clearances—In conceal work, wires should be not less than thr inches apart with a one inch clearan all around the wire. In open or expos wiring, spacing between conducto must be not less than 2½ inches with inch clearance all around the wire. Th applies to 110/220 volt light or pow wiring. When passing through jois wires should be not less than 2½ inch from the floor above to prevent dama from nails driven in the floor.

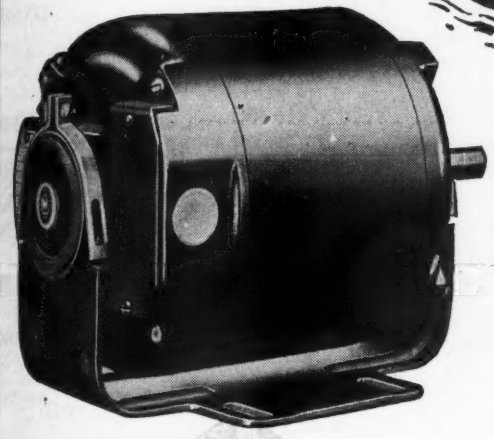
Troughs and Guards—Troughs m be installed to protect exposed condu tors where subject to moisture from dri ping pipes in wet or damp location Guard strips are required where op wiring is run overhead on ceilings, less than seven feet from the floor. Stri should be ⅞-inch lumber and should e tend beyond the last knob or cle Exposed wiring on side walls must boxed in up to a height of seven feet.

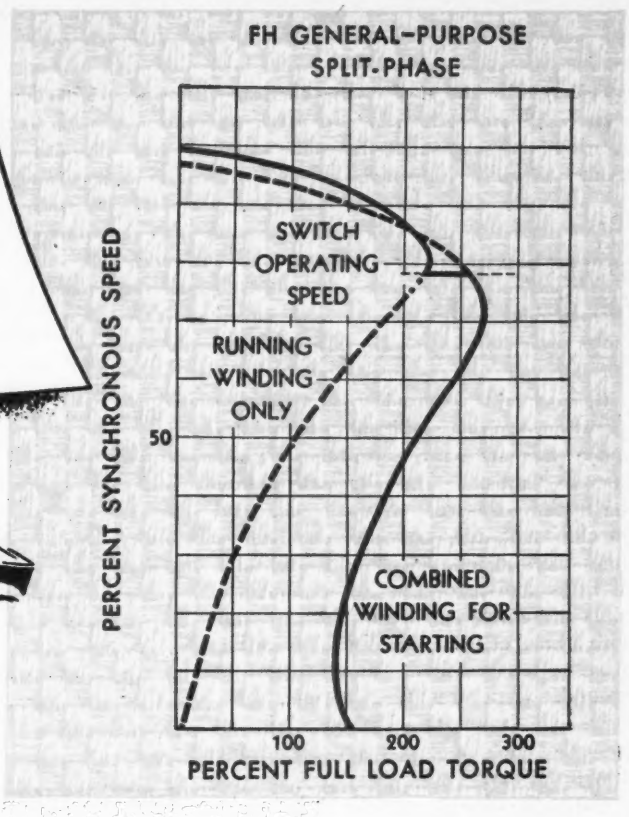
SILVER RING BUSES for the aluminum pots are assembled on tables such as this in New York city's Aluminum Company plant. Note the Treasury guard whose duty it is to protect the silver while it is being handled. All the bus sections were drilled oversize to specification before shipment from the Treasury Department so that no bar would have to be reamed. Nor could the bar be tapped, filed, sanded, or mutilated in any way.

Torque Talks

ON MOTORS FOR WAR AND POST-WAR NEEDS







MOTORS THAT MUST BE ALWAYS "On the go"

Certain small motor jobs call for frequent starting . . . the kind of repeated "stop and go" that's tough on motors.

When this type of drive is needed, special attention should be given to the starting current taken by the motor, as some motors require considerably higher starting current than others.

Type FH General-Purpose Split-Phase Motor is just the motor you'll want when medium starting and breakdown torques are needed. Starting current is low—within standard NEMA values.

Type FH motors are especially suited for blowers and circulating pumps aboard ships; heating fans and oil burners in war plants and similar frequent-starting applications.

ASK FOR APPLICATION HELP

Small motors have gone to war . . . some on wartime applications of peacetime products . . . many others on specialized war applications. For further information on Westinghouse small motors, watch for additional "Torque Talks" or write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. J-03195

PICK THIS MOTOR

- Where medium starting and breakdown torques are required.
- Where starting currents must be kept within standard rated NEMA values.
- Where frequent operation is called for and duty cycle is more than 1000 hours per year.

Type FH General-Purpose Split-Phase Motor

PHASE—Single **CYCLES**—60, 50, 25
HORSEPOWER—1/20 to 1/3
VOLTS—115 or 230
SPEEDS—(approximate full load rpm)
60 Cycles . . . 3450, 1725, 1140, 860
50 Cycles . . . 2850, 1425, 960
25 Cycles . . . 1425

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SMALL MOTORS

Transfer Fittings—When changing from conduit or BX to an open wiring addition or extension, approved terminal fittings should be provided.

GASOLINE WINCH FOR TOWER WORK

INDUSTRIAL

In steel mills employing blast furnace operation, bushing and insulation maintenance presents quite a problem. Blast furnace "slips," caused by cave-ins of the upper coke-crust in the stack, send up clouds of flue dust which settles on the porcelain insulators and bushings. A little moisture plus some sunshine coats the entire surface of the insulator with a hard crust. This flue dust coating provides an excellent leakage path to ground. If not removed in time, flash-overs will occur, and the porcelain becomes cracked and pitted necessitating new porcelain.

Carnegie-Illinois Steel Corp. has quite successfully licked this problem through their Improvement Record System whereby employees contribute materially in procedure simplification through a suggestion program.

At one C-I plant, the 44 kv. tower lines parallel the blast furnace stacks and the insulators accumulate flue dust coatings at a rate necessitating replacement every two months. Tower work is thus seen to be extensive. In order to reduce line outage to a minimum, spare insulator strings are stocked in such quantity to allow complete renewal. The coated insulators are then soaked over night in a flue dust solvent, wiped clean, dried and returned to stock.

Over a period of time during which various simplified procedures have been adopted, the replacement job has been reduced from a two tower man eight hour job to a one tower man four hour job. The present procedure involves the use of a gasoline driven winch to carry the span load in place of the much slower and troublesome method utilizing pulley blocks. Light aluminum 18 foot ladders are used in place of wooden ones reducing handling weights from 78 pounds for the wooden ladder to 35 pounds for the aluminum. The light weight ladder permits easy manipulation in the air by one tower man. Hooking the ladder over the tower arm allows him to drop down into work position where he attaches the winch line. As the winch picks up the span load, he un-pins the insulator string, drops it to the ground, pins in the new string, bolts the hi-line at the connector and proceeds to the next string.

HIGH VOLTAGE FIXED EXPENSE CAN SHORT CIRCUIT PROFITS

MANAGEMENT

By Arthur Roberts

The overhead problem for those contractors who are not flush with war business is especially acute today.

Why do some electrical contractors suffer more over headaches than others, particularly at a time like this when it is necessary to keep expenses at minimum to get by? From our field studies, we can supply the answer. Our audits invariably disclose that the contractor with high fixed expense is the man who goes off the beam in trying to cut over-head. The contractor with low fixed expenses has an easier job to economize. This is one feature of overhead that few contractors understand and explains why some are able to get out from under a high overhead with comparative ease whereas, others meet all kinds of Gremlins.

For illustration take electrical contractor Jones with a volume of $121,600 in 1941, before Pearl Harbor started restricting operations. That year his condensed profit and loss statement showed:

Sales	$121,600
Cost of sales	72,960
Margin on sales	$48,640
Overhead expenses	
Fixed expense $28,360 (2)	
Variable expense 14,180 (1)	
Total overhead expense	$42,540
Net profit on 1941 sales	$6,100

Now, take electrical contractor Smith with approximately the same volume in 1941, and similar operating ratios, as his condensed profit and loss statement shows:

Sales	$121,000
Cost of sales	72,600
Margin on sales	$48,400
Overhead expenses	
Fixed expense $14,110 (1)	
Variable expense 28,220 (2)	
Total overhead expense	$42,330
Net profit on 1941 sales	$6,070

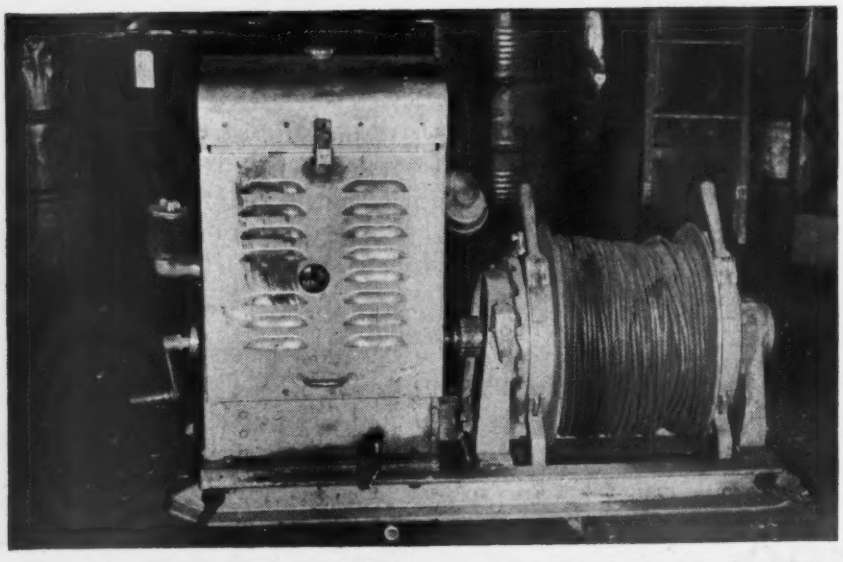
Along comes 1942 with price control, shortages, priorities and other wartime Gremlins that depressed volume, so both contractors decided to swing the axe on overhead. Jones got this result shown on his profit and loss statement for 1942.

Sales	$101,400
Cost of sales	60,840
Margin on sales	$40,560
Overhead expenses	
Fixed expense $28,360	
Variable expense 9,926	
Total overhead expense	$38,286
Net profit on 1942 sales	$2,274

Smith got this result in 1942.

Sales	$100,800
Cost of sales	60,480
Margin on sales	$40,320
Overhead expenses	
Fixed expenses $14,110	
Variable expenses 19,754	
Total overhead expenses	$33,864
Net profit on 1942 sales	$6,456

Both contractors experienced a similar decrease in sales volume, and note again that Smith's sales were $600 less than Jones, yet, he earned $6,456 net profit against $2,274 for Jones. The joker



***THIS GASOLINE DRIVEN WINCH** is used to carry the span load in the replacement of high tension insulators. It is also used in remote areas where customary sources of power are not available. In grinding slip rings, the cable is removed from the drum and belted to the shaft of heavy rotors for rotation during the operation.*

To simplify fixture installations, Ballasts are available having the leads coming out of the bottom.

FOR PEAK LIGHTING PERFORMANCE

• The satisfactory performance of fluorescent lighting depends to a great extent on the Ballasts,—and at Jefferson Electric the importance of this unit is well recognized,—and design, selection of all materials, construction and expert craftsmanship all contribute to the reliability for which transformers and ballasts bearing the Jefferson Electric mark have long been known.

Where groups of fluorescent lamps are installed, great savings in copper and other metals are possible by using Multi-Lamp type Ballasts. Costs are cut and installation time reduced. Four 100-watt lamps, for example, served by one Four-lamp Ballast saves 50 per cent of the cold rolled steel, silicon, and copper required for two two-lamp 100-watt Ballasts. Too, power losses are reduced, and since four-lamp Ballasts may be used on 250-280 volt circuits, conductors can be smaller than for 110-130 volt circuits, another saving of copper.

Jefferson engineers introduced Ballasts with bottom leads to facilitate installation on shallow wiring channels, available in the popular capacities,—two- and three-lamp 40-watt; two- and four-lamp 100-watts.

Write for Bulletin 421-FL which carries full data. Recommendations of our engineers are yours for the asking. . . JEFFERSON ELECTRIC COMPANY, Bellwood, (Suburb of Chicago) Illinois. Canadian Factory: 60-64 Osler Avenue, West Toronto, Ontario.

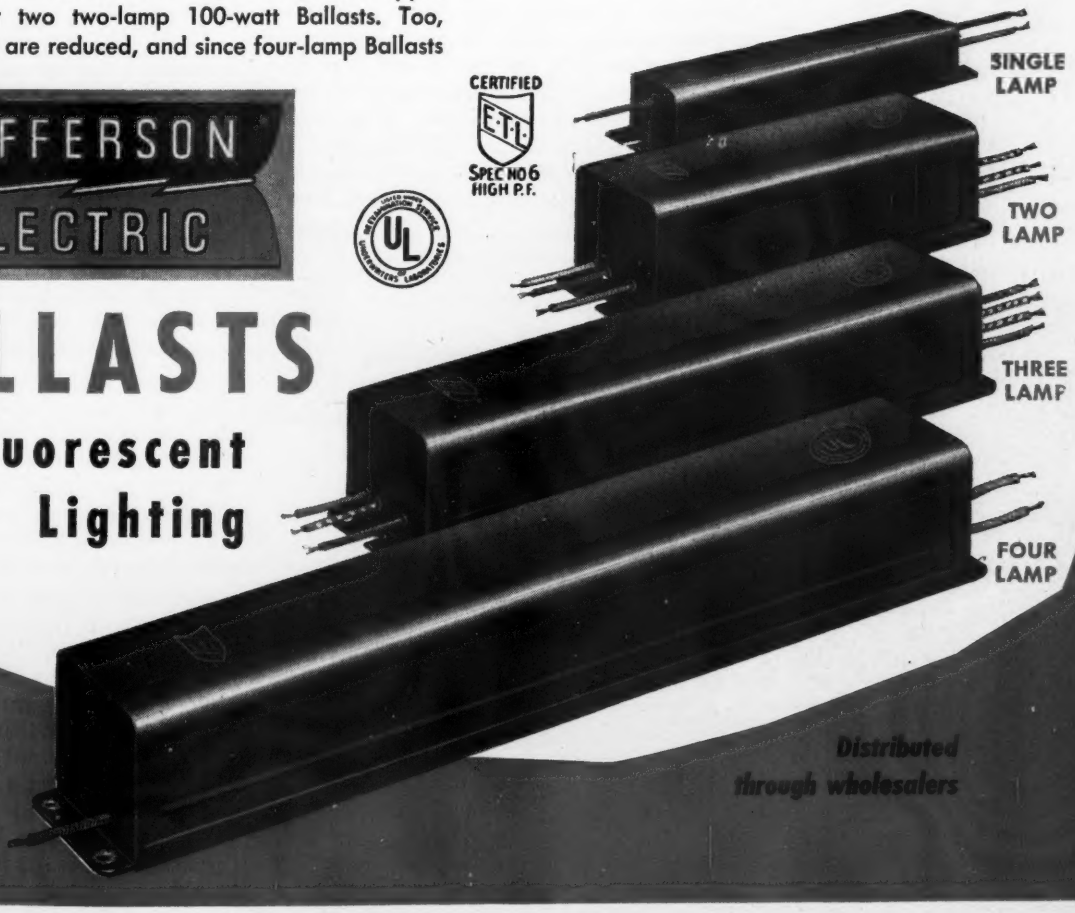
JEFFERSON ELECTRIC

CERTIFIED E·T·L SPEC NO 6 HIGH P.F.

UL

BALLASTS

For Fluorescent Lighting



Distributed through wholesalers

lies in the fixed to variable ratio. Many contractors assume that an expense is an expense and although this is correct insofar as the dollar-for-dollar obligation is concerned, there is a big difference between a fixed expense and a variable expense in its effect on profits when sales swing low. Then, a high ratio of fixed expense may make it impossible to show a satisfactory profit with the best business management. That is the main reason why some contractors find it tough sledding today and others easier traveling in our wartime economy. Notice that Jones' ratio of fixed to variable expense in 1941 was 2 to 1, or his fixed expenses were twice as many dollars as his variable expenses, whereas, Smith's ratio was just the opposite. His variable expenses were twice his fixed expenses, or a variable to fixed ratio of 2 to 1. In 1942, when war restrictions began to depress volume, both contractors started to cut expenses to keep net profits in line. Their fixed expenses were constant and could not be reduced so they had to concentrate on their variable expenses: to wit:

Electrical contractor Jones	
Total overhead expense....1941....	$42,540
Total overhead expense....1942....	38,280
Decrease....30 per cent of $14,180 variable expense	$4,254
Electrical contractor Smith	
Total overhead expense....1941....	$42,330
Total overhead expense....1942....	33,864
Decrease....30 per cent of $28,220 variable expense	$8,466

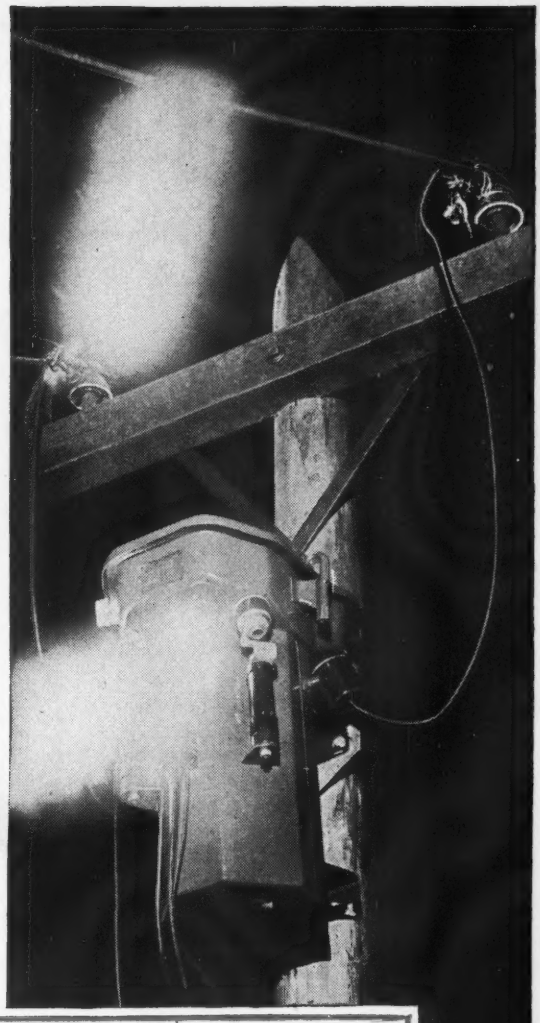
Both contractors cut their variable expenses 30 percent, indicating that they were equally efficient with the nippers but Smith's ratio of variable to fixed expense enabled him to use expense control more effectively. Jones was stymied by too high a ratio of fixed expense. His proportion of variable expense was too low. Even though he cut close, his efforts were stymied by the high ratio of fixed expense, which he couldn't cut. Smith, on the other hand, with a bigger field to work in, $28,220 in variable expense against $14,180 for Jones, took a grand slam at this portion of his overhead in 1942 and saved $8,466.

"But what can I do if my fixed expense is off the beam?", you may ask. In some instances, contractors with high fixed charges can do nothing about it but it is better that they understand their predicament than to operate "in the blind." At least, they have a chance to get out from under a high fixed expense if they know what it's all about and make an intelligent effort to solve the problem. Those that can't, will take a

[Continued on page 139]

1933-1943

10 YEARS OF WAR ON LIGHTNING OUTAGES



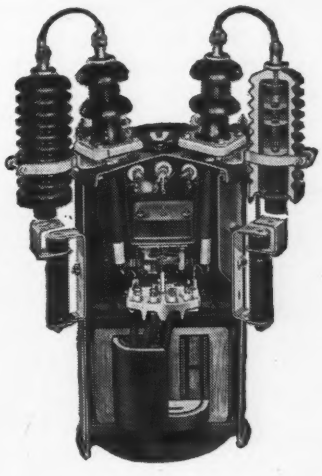
...WON BY C S P TRANSFORMERS!

Lightning, ten years ago, caused nearly all distribution system outages. In 1933, for the first time, this destructive force met its match—the CSP Transformer designed by Westinghouse.

In the CSP Transformer, 3-Point Protection and "De-ion" Gaps tame lightning. They were the first protective devices to provide adequate surge-current capacity to handle *direct* lightning strokes.

The "De-ion" Gap provides an ionized path of low resistance, established each time a flashover occurs. Coupled with 3-Point Protection, it positively eliminates lightning damage to transformer windings.

The operating record of 343,000 CSP Transformers now in service shows conclusively that damage from lightning, short circuits and dangerous overloads has been effectively eliminated. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-70424



Completely Self-Protecting

- **against Lightning**
- **against Burnouts from Short Circuits**
- **against Burnouts from Overloads**

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

DISTRIBUTION TRANSFORMERS

MODERN LIGHTING

ILLUMINATION OF WELDING FLOOR

At the Bethlehem-Hingham shipyard in Boston, Mass., welding operations are carried on under a good even distribution of light. In shipyard operations, all prefabricated parts are manufactured in the so-called steel mill. As much fabrication as possible is done in the mill where the huge, heavy sections of steel plate can be easily manipulated. As mill sections are completed, they are taken by Whirley cranes out across the yard and on to the ship where they are welded into place.

A maintained foot-candle level of between 20 and 24 foot-candles are provided throughout the entire steel mill floor area. The large size and bulk of some of the fabricated sections which must be handled in the mill by overhead cranes, necessitate a high crane level and higher lighting fixture mounting. High-bay mercury units of 400-watts are staggered with 1500-watt incandescent units to provide the quantity and quality of illumination required. The mounting height is 45 feet and centers are 25-feet by 35-feet. Glass reflectors are used throughout exclusively in the steel mill and machining areas.

***STEEL MILL ILLUMINATION** of more than twenty foot-candles is provided by staggered mercury and incandescent units. Fabrication of steel plate sections for shipbuilding is done on this floor by electric welding.*

Each fixture is hung on a goose-neck with a hook forged on one end. The goose-necks are bolted to the cross girders as are the transformer units for the mercury lamps. Each fixture is provided with a short cord and plug. In this manner, maintenance becomes only the simple procedure of unplugging and unhooking each unit while standing atop the travelling overhead cra Reflectors can then be washed on t crane catwalk and replaced in service only a few minutes. Distribution feede running the full length of the buildi are run open on three spool rac Branch circuits run from panels to r ceptacles in EMT. The entire load h been carefully balanced on the th phase distribution.

Another example of the results Bethlehem's "plentiful illumination" d sign is the machine shop. Here, bet than 40 foot-candles of general light provided by 500-watt incandescent uni mounted at 23 feet on 16 by 20-fo centers. A white paint job on walls a ceilings has given excellent results providing even distribution and redu ing shadows to a minimum. Here aga lighting distribution feeders are run open with EMT for branch circuits.

The fixtures cannot be so easily r moved here as in the steel mill, for th are rigidly hung by a conduit nipp from the four inch connection box abov However, the maintenance problem not as great as in the steel mill whe welding fumes are heavy.

The significance of a good paint jo should not be minimized. Its worth h been proven time and again in raisi general illumination foot-candle level It can't be used as a substitute for a ditional fixtures, but its value as a su plement is considerable.

***MACHINE SHOP ILLUMINATION** is provided by 500-watt incandescent units mounted at 23-feet on 16 by 20-foot centers. Absence of shadows and even distribution of light is due in part to newly white-painted walls and ceilings.*

The New Curtis WARRIOR
Fluorescent Unit for Offices and Drafting Rooms

Easy to INSTALL . . .

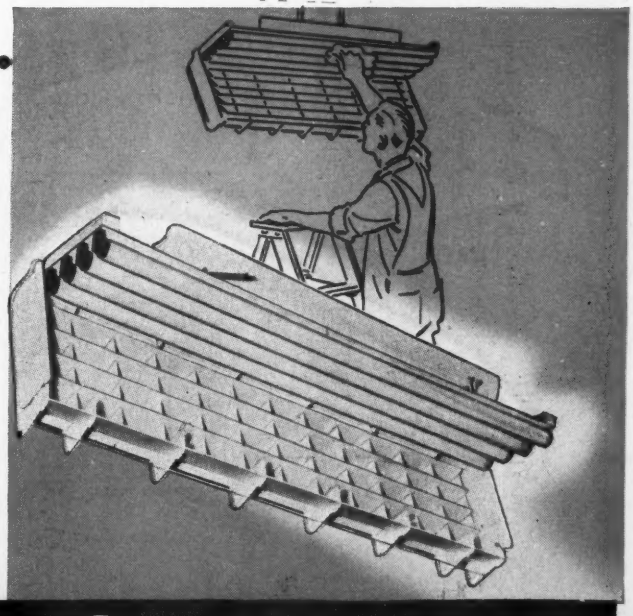
Beauty is only skin deep, but in the case of the new "Warrior" luminaire, an attractive exterior hides the solid qualities of good design and workmanship that have made the Curtis reputation. "Warrior" is easy to install and is adapted to a wide variety of lighting problems . . . excellent for either pendant or ceiling mounting or for long continuous runs.

Reflector and louvres are finished Fluracite for high efficiency, and the 45° crosswise and 30° lengthwise shielding provided by the well designed louver is hard to beat.

Easy to MAINTAIN . .

The spring catches on each side of the "Warrior" hold the entire louver and end assembly in position. Releasing the two catches on either side permits the entire assembly to swing open for cleaning and lamp replacement. To remove the assembly release all four catches.

The "Warrior" luminaire is for four 40-watt fluorescent lamps per section. Write for catalog sheet giving complete information.

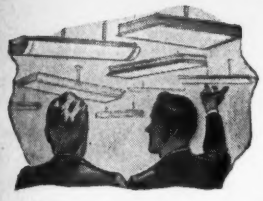


CURTIS Lighting, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS


Certified!
Certified
FLEUR-O-LIER
The Manufacturer guarantees by affixing this label that this Fluorescent Luminaire is a duplicate of samples found by periodic examination to comply with the minimum requirements as set up in the
"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
which are sponsored by the Manufacturers of Mazda Lamps.
Electrical Testing Laboratories, Inc.
NEW YORK, N. Y. 4-42
A COPY OF THIS CERTIFICATE SHOULD APPEAR UPON EACH UNIT OR PACKAGE
E·T·L
E·T·L
FLUORESCENT LIGHTING FIXTURES EMPLOYING EXISTING TYPES OF LAMPS ARE NOT RECOMMENDED FOR SCHOOLS, OFFICES AND SIMILAR LOCATIONS UNLESS LAMPS ARE SHIELDED FROM DIRECT VIEW
THIS CERTIFICATION IS CONTINGENT UPON EMPLOYMENT OF CERTIFIED ALLIED LAMPS OF OVER 85% POWER FACTOR
WAKEFIELD
SPERO
SMITHCRAFT
CURTIS
SEGIL
GRUBER
KEYSTONE
MITCHELL

NEW COMMERCIAL FIXTURES BEARING FLEUR-O-LIER LABEL *now ready!*



FLEUR-O-LIER Manufacturers, following the recent amendment to WPB order L-78, offer you a wide variety of new commercial-type *certified* fluorescent fixtures. And additional designs are on the way—from many other FLEUR-O-LIER sources other than those shown.

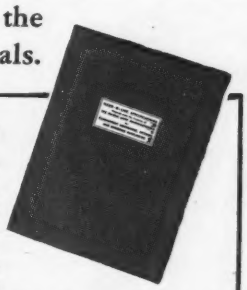
Essential offices, factory drafting rooms, hospitals, and various public institutions can obtain these new units on a priority of A-1-j or higher; and on an MRO order on a priority of AA-2 or higher.

Protection for supplier and user

The big news about these new fixtures is that they give you the famous CERTIFIED FLEUR-O-LIER protection, dependability and service. Like all other types of fixtures bearing the FLEUR-O-LIER label, these commercial-type units are tested and checked by impartial experts—Electrical Testing Laboratories, Inc. of New York . . . and *Certified* by them as meeting FLEUR-O-LIERS' 50 definite standards of electrical, mechanical and lighting excellence.

Better than ever!

These new FLEUR-O-LIERS combine the best features of pre-war equipment, plus improvements developed to aid the war effort. And, of course, all of the various leading fixture manufacturers making these units conform to WPB limitation orders in the use of critical materials.



GET THIS BOOK!

You'll want this valuable book containing complete FLEUR-O-LIER engineering specifications. You quickly see why Certified FLEUR-O-LIER fixtures give you the protection and dependability you need and want. With it you get the FLEUR-O-LIER story and list of manufacturers. Write FLEUR-O-LIER Manufacturers, 2122-1 Keith Building, Cleveland 15, Ohio.

Let's all BACK THE ATTACK—buy more War Bonds

Some of the fixtures shown have already been certified . . . others are in the process of testing and certification.

FLEUR·O·LIER

Manufacturers

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

LIGHTING FOR CRITICAL MANUFACTURE

In the manufacture of the rubber components for our war machines such as rafts, self-sealing gasoline tanks and the like, it is obvious that the assembly is of a very critical nature. Defects must be spotted before incorporation into the assembly, seams must be made correctly and in general most of the work is done to close specifications. The entire manufacture and inspection is quite a ticklish proposition and is done almost entirely by women employees.

To limit rejects to an absolute minimum, Hood Rubber Company of Watertown, Mass., decided to provide plentiful illumination to meet the requirements from the very beginning.

One department has now been converted to a manufacturing area for self-sealing gas tanks. Originally, incandescents installed on a two-watts-per-square-foot basis provided about 15 foot-candles. The present conversion to fluorescent has been installed on the same basis of two watts per square foot at a slightly lower mounting height with the net result of more than double the foot-candles of maintained illumination, around 35 to 38 foot-candles.

The center distances are six feet by six feet eight inches, mounted at a height of seven feet or four feet above the working level. Messenger wire is used for the suspension of fixtures and to carry the circuits. Fixtures are two tube, 40-watt whites.

In the manufacturing area for rubber boats the mounting dimensions were made a little greater at the sacrifice of a few foot-candles, but illumination is still plentiful for the work is not quite so critical. Mounting centers are eight feet by eight feet at a height of about nine feet from the floor. The fixtures here are of the same type.

LIGHTING FOR SCALES, VERNIERS AND MICROMETERS

The solution of seeing tasks involved in reading scales, verniers and micrometers will be covered in this the fourth article in a series on Lighting for War Plant Machine Tools. The recommendations made herein are those presented by R. E. Lagerstrom, lighting engineer, G. E. Lamp Dept., Chicago, at sessions held by the Chicago Lighting Institute in co-operation with the local WPB office. The suggestions are based on a thorough study of local manufacturing plants by a committee of lighting engineers.

Undoubtedly the most severe visual task involved in machine tool operation is the reading of scales, verniers and micrometers—used both in setup and actual operation of the machines. This is one instance where the machine manufacturer can do much to help the operator—from the standpoint of proper design and contrasts on the scales.

Scales—Many of the machines investigated have scales set at an angle with a hair-line on the vertical surface of the machine—making the hair-line almost totally invisible from the normal viewing angle and causing the operator to squint in order to see it. Other machines have the index-line on the horizontal plane. Here, both the index-line and the surrounding surface collect grease and dirt making it practically indistinguishable.

There are cases where the individual machine operator has exercised his own ingenuity to make scale reading easier—such as painting the index-line white or some contrasting color; or painting the background white and rescratching the line. Investigation has disclosed that best visibility is obtained when the scale is beveled and the index-line is in the same plane as the scale. Scales are most readable through the contrast between the black divisions and numerals against

THE ABOVE FLUORESCENT INSTALLATION replaced an incandescent system on the same wattage per area basis and more than doubled foot-candles on the working level.

Announcing

THE NEW

URC-448

SPERO U. R. C. FLUORESCENT FIXTURE

GET THESE ADVANTAGES OFFERED IN THE NEW U. R. C. DESIGN

HIGH LIGHT INTENSITY—Tests show 16 foot candles per watt per square foot—evenly distributed.

LOW SURFACE BRIGHTNESS—Resulting from specially developed prismatic, diffusing glass panels.

SPERO "INSTA-LITE"—Providing instant lighting without starter. At slight extra cost.

ATTRACTIVE MODERN DESIGN—Engineered for most efficient light distribution.

INSTALLATION SIMPLE AND QUICK—For pendant type, flush or continuous row mounting.

EASY MAINTENANCE—Glass panels readily removed for cleaning and servicing lamps. Wiring channel easily accessible from below.

SPERO U. R. C. DESIGN—Meeting "Better Light—Better Sight" requirements, and conforming to the latest W.P.B. limitation order on use of metal.

IDEAL FOR ALL TYPES OF COMMERCIAL INSTALLATIONS

This new unit was developed by the Utilities Research Commission to meet the demands for a fluorescent fixture complying with WPB's Limitation Order L-78, at the same time providing a highly efficient shielded light source and approaching natural daylight, with all objectionable glare and shadow eliminated.

Its attractive lines and scientific engineering make it ideally suited to all types of commercial installations. The four 40 watt lamps are shielded by translucent diffusing glass panels on bottom and sides. The same fixture is adaptable to pendant, flush and continuous-row mounting. Available with Spero "Insta-Lite"—for instantaneous starting and reduced maintenance.

LIST PRICE Less Tubes **$39.95** **West and South $43.95**

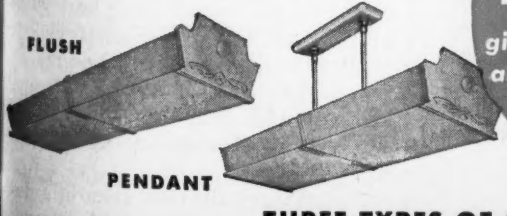
With SPERO INSTA-LITE $51.95
West and South $55.95
For Pendant Type Mounting, add $1.75

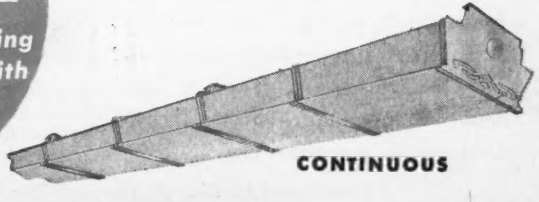
Write today for descriptive literature

Also available with

INSTA-LITE

gives you Instant Starting and Instant Lighting with NO starting switch





THREE TYPES OF MOUNTING WITH THE SAME FIXTURE

THE SPERO ELECTRIC CORPORATION
18222 LANKEN AVE. ★ CLEVELAND, OHIO

a reflection in the polished surface of the scale. Obviously, the black marks would be more visible if the reflection seen in the scale background were white or a light color. A white apron on the operator (if it remained white) would be of great help in providing the light reflection.

Verniers and Micrometers—are somewhat the same as the scales on the machines, except they are used only during the setup operation and for regular checking during the machine operation. However, the seeing task is critical and the operator must see with a degree of certainty high enough to insure against any error in reading.

In both of these instruments there are two scales, one set at an angle with respect to the other. The *vernier* has two flat scales and for best visibility, requires a reflection of reasonable uniform brightness in both scales simultaneously. Obviously, it would be best to get the reflection from a large area light source of relatively low brightness somewhere near the machine. If a local lighting unit is used the vernier or micrometer should be held close enough to the light source so that both scales will reflect an image of the source toward the operator's eye at the same time. Investigation revealed that a white area about the size of a piece of business stationery on the operator's chest gave a reflected image toward the eye which improved visibility —indicating that there is some value in the reflection from an operator's clean white apron.

The problem in the case of *micrometers* is more severe since both scales are curved, with the markings on one of them being across the axis of the curve and on the other one parallel with the axis of the curve. This means that a relatively large light source will form a small image in the micrometer surface. However, some of the new micrometers do not have a highly specular surface—providing a distinct aid to reading the scales, particularly where there is no large area of uniform brightness available to be reflected in the scales.

Even where a large area source is present, it is necessary to hold the micrometer close to this source in order that the angle from the micrometer intercepted by the source be at least 90 degrees. Because the micrometer cylinder is small in diameter, the 90 degree section of the curve will still be quite small and any reflection occupying a much smaller angle would not be an aid to seeing.

An ordinary filament lamp in a deep bowl reflector is not a good light source for reading micrometers, even though the instrument is held relatively close to the source. Brightness of the lamp in the reflector makes a sharp line in the reflected image that interferes with the visibility of the micrometer scales.

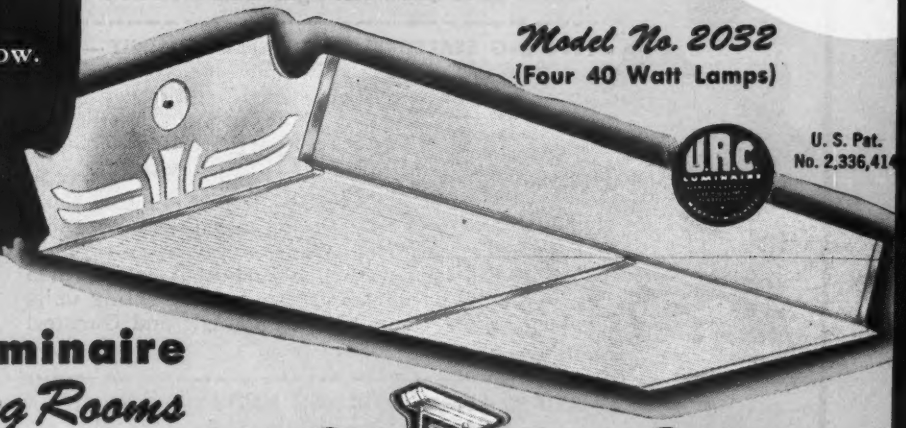
FROM EVERY STANDPOINT . . . A STANDOUT FOR WORK AREAS IN WAR INDUSTRY

MITCHELITE
Model No. 2077

"MITCHELITE" *for Industrial Lighting*

These rugged, lightweight, all-purpose fluorescent fixtures are doing a great lighting job in war industry today. MITCHELL innovations make them simpler . . . more flexible . . . more economical to install and service. And they're tops in lighting efficiency. MITCHELITE accessories provide for every method of mounting or hanging . . . individual or continuous row. 3 Models answer every need: 2 and 3-light units using 40-watt lamps; 2-light unit using 100-watt lamps. U.L. and FLEUR-O-LIER APPROVED.

Individual or Continuous Row

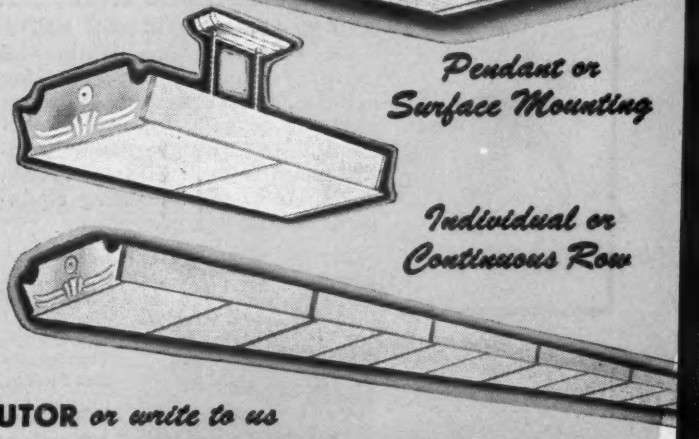


Model No. 2032
(Four 40 Watt Lamps)

U. S. Pat. No. 2,336,41

U. R. C. Research Luminaire *for Offices and Drafting Rooms*

America's No. 1 Commercial Fixture! Uses four 40 watt lamps in such a scientific manner as to provide the ultimate in high intensity illumination with low surface brightness (glare). Mounted on tracks—requires less time to install than any other commercial fixture. Surface or Pendant mounting—individually or in continuous rows. Now uses less than 6 lbs. of metal. Available at the original low price!



Pendant or Surface Mounting

Individual or Continuous Row

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MITCHELL *Manufacturing Company*
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MITCHELL FLUORESCENT

How to Use Available Benjamin Lighting Units to Make Needed Lighting Improvements Now

FROM THE AVAILABLE BENJAMIN LIGHTING UNITS LIKE THESE, CAN BE SELECTED FIXTURES TO PROPERLY LIGHT EVERY SEEING TASK

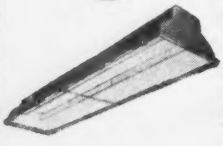
RLM DOME PORCELAIN ENAMEL UNIT—The accepted standard for general lighting. Provides illumination on both horizontal and vertical surfaces with minimum of shadow; high lighting efficiency.

ELLIPTICAL ANGLE PORCELAIN ENAMEL UNIT For wide, even distribution of light from the side; also where there are overhead obstructions . . . too high ceilings . . . vertical surfaces to be lighted.

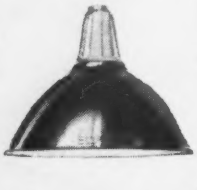
RLM BOWL PORCELAIN ENAMEL UNIT—For localized lighting of many machines, assembly and inspection operations involving difficult seeing conditions which may require exceptionally high footcandles running up to 50 to 75 or more footcandles.

EXPLOSION-PROOF . . . DUST-TIGHT UNITS—For lighting locations involving explosive atmospheres or explosive inflammable dusts, a complete line of Benjamin Explosion-Proof and Type II-G Dust-Tight Units are available.

WATER-TIGHT UNITS—Benjamin "Vapolet" lighting fixtures are recommended for such locations as boiler rooms, pump houses, power houses, hydro-turbine rooms, chemical plants, ice houses, loading platforms, basements, quarries, pits and other locations where weather-proof and water-tight units are essential.



TYPE II-G SEALED-FLO FLUORESCENT UNIT—This porcelain enamel unit is designed for use in dusty, dirty, damp locations where high lighting levels are essential. It is listed by Underwriters' Laboratories for certain hazardous locations.



MERCURY VAPOR LIGHTING UNITS—Best seeing conditions for certain seeing tasks are obtainable through the use of Benjamin Mercury Lamp Units or combination mercury and incandescent units. These are available in a complete range of lighting units which include Dome, Elliptical Angle and Glassteel Diffuser types.

ELLIPTO-LITE FLOODLIGHT UNITS—for protective floodlighting of factory yards and grounds and for lighting outdoor work areas, these porcelain enamel open-type Benjamin Ellipto-Lite units provide effective illumination. For complete data on Benjamin Floodlighting equipment see Catalog 26.

A lighting checkup made now will uncover many locations where production experience reveals the need for improved lighting to improve workmanship, increase production, increase safety, reduce fatigue or improve employee morale.

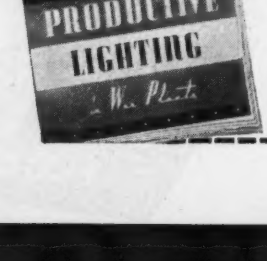
These lighting problems require for their solution the correct selection and installation of lighting units that meet every requirement of the location as well as the seeing task.

From the available Benjamin Lighting units, proper lighting can be provided . . . lighting that is correct from the viewpoint of sufficient light, quality of lighting, light distribution, light diffusion, light control, shielding, maintenance and safety.

Send for Free Manual of Lighting Problem Solutions

In this 32-page guide to Productive Lighting in War Plants are contained 21 ready to use solutions of the lighting problems most commonly encountered in industrial production. Use of this guide and the data contained in Catalog 26 will enable you to specify Benjamin Lighting units to meet practically every seeing requirement. For a complimentary copy sent without cost or obligation, write Product Information Dept H, Benjamin Electric Mfg. Co., Des Plaines, Ill. or MAIL COUPON TODAY.

BENJAMIN TRADE MARK
Lighting Equipment
Distributed Exclusively Through Electrical Wholesalers



Benjamin Electric Mfg. Co., Product Information Dept. H, Des Plaines, Illinois

☐ Please send me, without cost or obligation, a copy of the Manual . . . Specifications for Productive Lighting in War Plants.

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INDUSTRIAL ELECTRIFICATION

ENGINEERING • INSTALLATION • MAINTENANCE

Electronic Control Maintenance

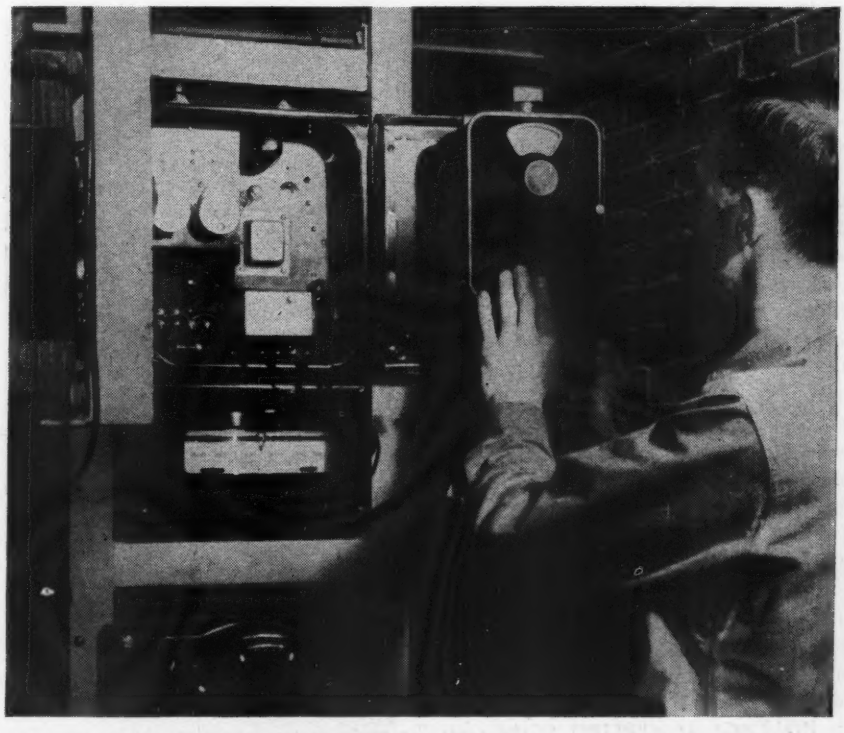
Preventive maintenance of electronic temperature control has greatly reduced spoilage at Fiberglas plant.

MANUFACTURE of glass fibers requires close temperature control of the molten glass. Molten glass acts somewhat like molasses: if too hot, it runs thin; if too cool it is too viscous. In one process for the manufacture of glass in textile form, continuous filaments are mechanically attenuated by drawing molten glass at high speed through orifices in the base of an electric furnace. Furnace heat is supplied from a low-resistance shunt connected as the load on the secondary of the furnace transformer. The secondary consists only of a loop of heavy copper bus. Therefore, direct control of secondary current is obtained by a number of taps in the primary winding. Taps are brought out to contact terminals, and tap switching is carried out automatically on signal orders from the electronic temperature device. Temperature of the molten glass must be rigidly maintained in accordance with manufacturing specifications to insure correct filament diameter.

Should the electronic temperature control get out of adjustment for a short time allowing a fluctuation of a few degrees, the diameter of the filament would vary to such an extent that it would have to be scrapped. Filament diameter, subject to rigid quality control, is determined by weighing 30-yard lengths. Spoilage has been greatly reduced by a strict maintenance program of the temperature control and furnace transformer equipment—an achievement which is recognized as important in view of the fact that glass in textile form is a critical material allocated by WPB for approved end uses such as electrical insulation, parachute, flare shades, and surfacing material for insulating board used on Navy vessels.

Maintenance Schedules

In one Fiberglas plant in the middle west, one man is assigned the responsibility of maintaining the furnace equipment at top operating efficiency. He supervises two men (who normally do repair work in the shop) who, in the event of an emergency, can bring a complete control unit to the scene of a breakdown, make the replacement, and get the furnace back into operation within a very short time. He has also at his disposal the very best of testing and calibrating equipment; a potentiometer, a resistance load box, a tube testing unit, Megger, and an analyzer composed of wattmeter, voltmeter and anmeter. His test unit also includes replacement tubes, plug-in type relays, screws, nuts, tools, etc., to facilitate the work.



***SMALL PORTABLE INSTRUMENT** on the right is designed to check the controller setting on the job. The control setting is measured first; then the standardization point is checked by the use of an independent scale. After the controller is standardized, it can be set back to the voltage originally measured. A controller can thus be checked, or a new one installed, without changing the control setting or the control level.*

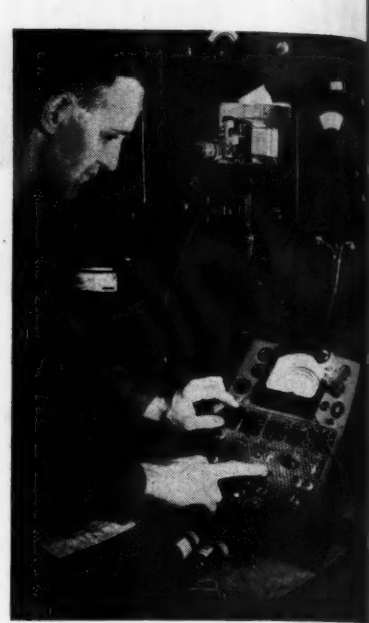
Each electric furnace unit has its own individual transformer and temperature control. The tester starts at one unit and proceeds to the next, making out a report on each unit "as found" and "as left" with comments on what should be done during the next shut-down period. When the circuit is completed, the process is repeated.

Once each month all furnaces are shut down for a few hours for necessary furnace repairs. At this time, if any electrical replacements or repairs are required, as shown by the testers' reports, they must be made within this period. During this period also, one-third of the furnace transformers are given a Megger test so that each transformer gets megged every three months.

Procedure

As the tester proceeds to the next unit to be checked, he first takes a reading of the thermocouple voltage with a potentiometer. By conversion of this voltage reading to degrees Fahrenheit, he can check the accuracy of the indicated temperature. To check the calibration of the indicator over the entire range of the scale, he applies a resistance load box to the circuit and impresses certain predetermined voltages. If the instrument does not read correctly it can be readjusted quickly. By use of the load box he also checks his control point; that is, the two predetermined values of temperature at which certain transformer turns are cut-in or cut-out to increase or decrease current for controlling the heat. An electronic tube in the thermocouple circuit actuates the relay which in turn operates the tap switch contactors. The operation of the relay depends upon the amount of current through the tube; the tube current depends upon the voltage impressed by the thermocouple. As the tube nears the end of its useful life the control point shifts; that is, more voltage must be applied to the tube to get the same amount of current through it to actuate the relay. Consequently, if the tube tests low, meaning that the control point has shifted, it must be re-tuned or replaced.

The relay is then tested and contracts checked for alignment. A plug-in type of relay is used, so that if defects show up, it can be replaced quickly, allowing the defective relay to be taken to the shop for repair. The tap switch contactors which undergo a normal duty cycle of one make-and-break every few seconds require a very careful inspection. Burnt tips are touched up or replaced if necessary and exact alignments checked. Because of the heavy currents carried, if contact surfaces get off-center burning is increased. Full use is made of the total contact surface. Three contacts are used to break the tap circuit simultaneously, the theory being that the arc is broken up into three more or less equal short arcs instead of one long arc, burning is reduced and contact life extended.



CHECKING ELECTRON TUBES. *These tubes are used in the electronic control circuit of the instrument and need replacing from time to time. Tubes are checked periodically by standard tube testing equipment.*

Cleanliness

The contactor cases require a thorough blowing out, and all contact points, moving parts, pivots and bearings must be cleaned. The control circuits are then completely megged, including the switch contactors and relays, to determine insulation condition. The analyzer is applied to the furnace transformer for checking input, output, power factor and efficiency. The analyzer is also valuable for shooting trouble.

The furnace transformer is primary controlled; that is, all tap switches are in the 440 volt primary circuit. Secondary rating runs down to a few volts and several thousand amperes. Consequently all connections in the secondary circuit are carefully checked, for loose connections at such high amperages might prove dangerous.

The complete test is run "hot" so as not to hinder operations. In the equipment design, maintenance features are a primary consideration. Assurance of uniform product can come only from a well maintained system of control. A control system which operates a complete duty cycle every few seconds is bound to develop recurrent trouble in the absence of periodic inspection for fault prevention. By-pass switches have

VOLTAGE IS APPLIED *to the controller under test in the shop by means of a "run-up box" voltage source. The resistance box is used to compensate for lead and couple resistance. The precision potentiometer measures the voltage at the terminals of the controller. The temperature indicated by the controller is checked against the precision potentiometer measurement by means of a temperature-voltage conversion chart, and the controller accuracy is established.*

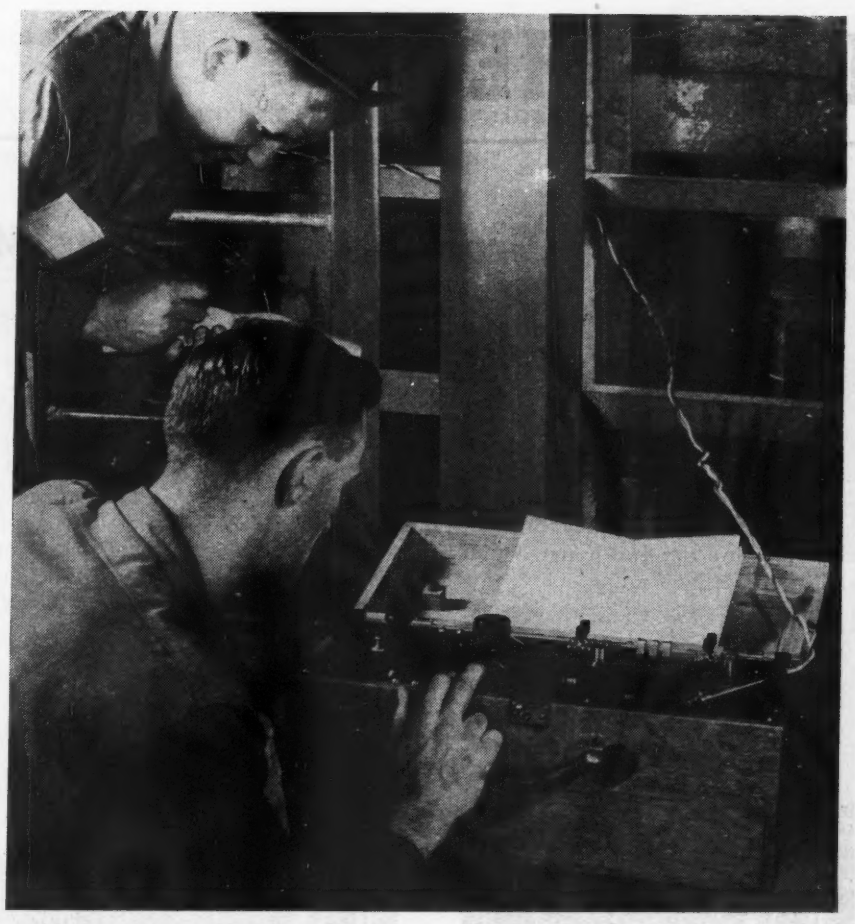
been provided to allow continuity of operation while any part of the equipment is under test.

Stock

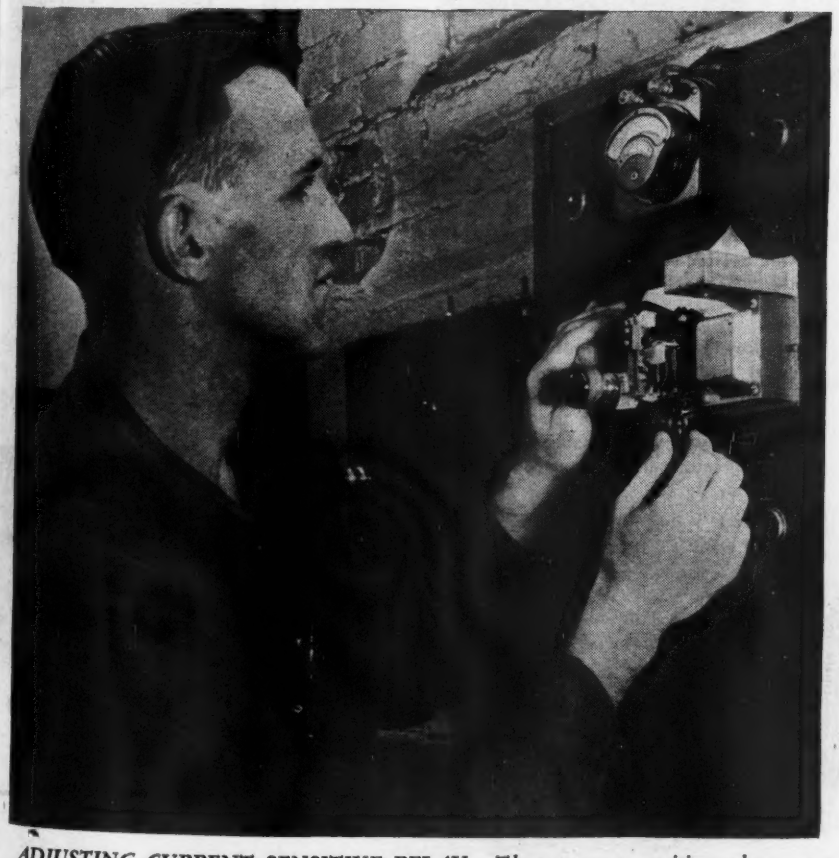
Several years' experience has shown that a stock of about 10 percent spares will maintain successful operation. Complete units are held in readiness so that any defective equipment may be pulled and replaced quickly. The faulty piece of control is then brought into the shop for restoration to A-1 condition. Shop facilities are such that pivots, bearings, toggles and any mechanical part can be reproduced if stock is not available. Coils can be rewound. The complete unit can be rebuilt from beginning to end if necessary.

Compressor Maintenance

In connection with the production of staple fiber (another variety of glass in textile form) compressed air is supplied for drawing molten glass after it emerges from the orifices. A large compressor driven by a synchronous motor supplies the required air. Once each month when the furnaces are shut down for a few hours, the compressor and auxiliary equipment are also shut down for a complete inspection. The compressor is located in the power house where also are located the coal-fired boilers. It is impossible to keep all the coal dust out of the compressor room although it presents a spotlessly clean appearance. During the brief shut down period the motor, m-g exciter set, control panels back and front, and all air contacts are thoroughly blown out. Commutators, slip rings, and all contact surfaces are then wiped with clean dry rags. Bearings and oil rings are checked and air-gaps gauged. Breaker insulation and all bushings are cleaned. Pressure switches and relays on the forced oil lubrication system are tested. Burnt contacts are replaced. All current carrying conductors including commutators, slip rings, brushholders and contactors are then megged, completing the inspection. The oil circuit breaker which is used for across-the-line starting is dismantled every three months to check the contact surfaces and insulating barriers. The oil is given a breakdown voltage test and, if it does not meet specifications, is replaced. Since loss of the air would mean complete shut down of the fiber plant, it is vital that trouble be anticipated. Preventive maintenance has proved to be the only solution.



***A PRECISION POTENTIOMETER** is used to check the glass furnace temperature. Thermocouple extension leads can be seen leaving the box at the right.*



***ADJUSTING CURRENT SENSITIVE RELAY.** These current sensitive relays are adjusted to operate at the current value of the electronic controlled instrument.*

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index.

L-1

Greasing Ball-Bearing Motors

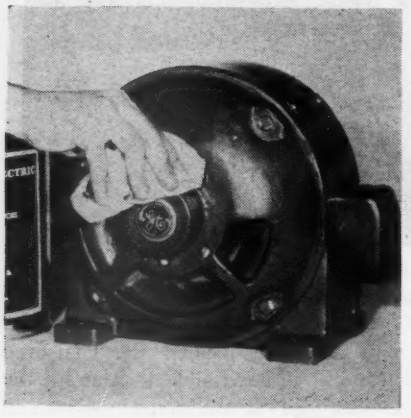
Equipped with Pressure-relief Greasing System

Determining the correct amount of lubricant in ball bearings is one of the most important problems in motor maintenance. Too much lubricant in these bearings can cause heating and other bad effects, just as will too little lubrication. Many motors have ball bearings arranged to be greased with a pressure gun. It is preferable for motors to be greased while they are in operation.

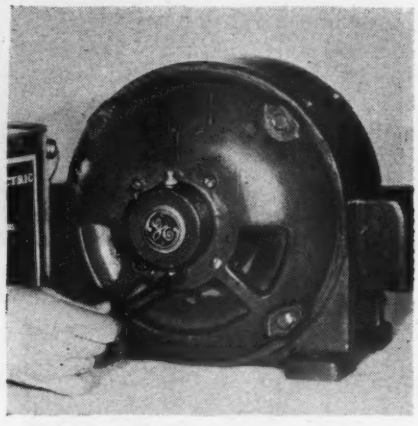
Only a high grade of grease, having the following general characteristics, should be used for ball-bearing lubrication:

1. Consistency a little stiffer than that of vaseline, maintained over the operating-temperature range.
2. Melting point preferably over 150 C.
3. Freedom from separation of oil and soap under operating and storage conditions.
4. Freedom from abrasive matter, acid, and alkali.

Motor manufacturers can generally supply proper greases.

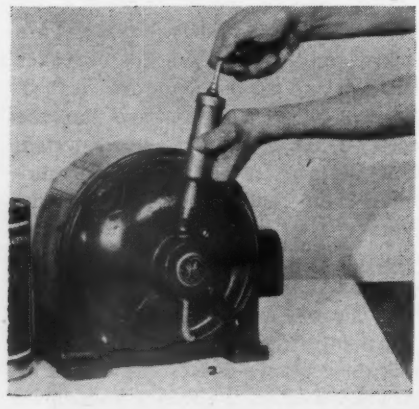


1 Make sure that no dirt gets into the bearing with the grease — wipe pressure-gun fitting, bearing housing, and relief plug clean.



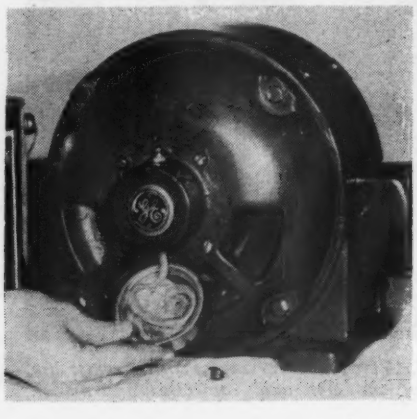
2 Always remove the relief plug from the bottom of the bearing before using the grease gun. This prevents putting excessive pressure inside the bearing housing which might rupture the bearing seals.

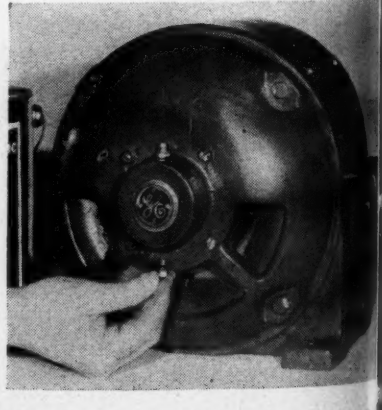
3 With a clean screw driver or similar tool, free the relief hole of any hardened grease, so that any excess grease will run freely from bearing.



4 With the motor running, add grease with a hand-operated pressure gun, until it begins to flow from the relief hole. This tends to purge housing of old grease. If it might prove dangerous to lubricate the motor while running, follow this procedure with the motor at standstill.

5 Allow the motor to run long enough after adding grease to permit the rotating parts of the bearing to expel all excess grease from the housing. This very important step prevents over-greasing the bearing. (Below)





6 Stop the motor and replace the relief plug tightly with a wrench.

Information from General Electric Company

DATA SHEET

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L-2

Cleaning Ball-Bearing Motors

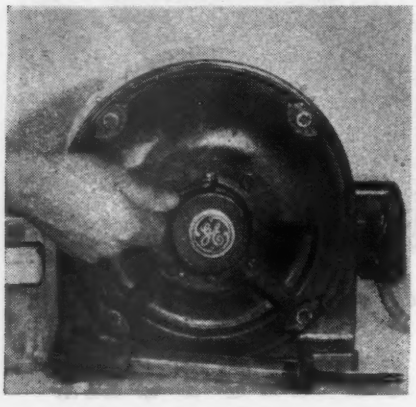
Equipped with Pressure-relief Greasing System

The pressure-relief method of greasing motors tends to purge the bearing housing of used grease. Complete cleaning of bearings, therefore, is required at infrequent intervals only. When the motor is disassembled for overhauling, it is easy to wash the bearings with a grease solvent, such as carbon tetrachloride. When the bearings are not disassembled, they can be cleaned by the following method.

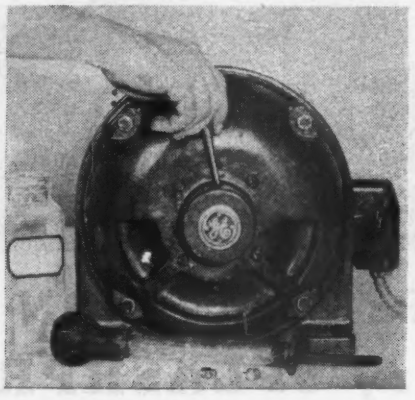
For a thorough and convenient flushing, use some solvent, such as a light mineral oil heated to a temperature of 165 F. or carbon tetrachloride. The latter is noninflammable, does not require heating, and dissolves grease more quickly than hot oil. When using carbon tetrachloride, however, be careful to remove all traces of it from the bearing housing and do not allow it to remain in contact with insulated windings in case of accidental splashing. Also, be careful of the toxic fumes of carbon tetrachloride.

This method permits the cleaning of all standard motors operating at an angle not exceeding 15 degrees from the horizontal (except totally enclosed, fan-cooled motors) without disassembly. The bearings and housings of vertical motors cannot be cleaned, except by a complete motor disassembly.

For totally enclosed, fan-cooled motors, the bearing at the pulley end may be flushed as described. To clean the fan-end bearing, first remove the fan cover and fan in order to make accessible the drain plug at the bottom of the housing. This procedure can be conveniently carried out whenever a general reconditioning of the motor is made.

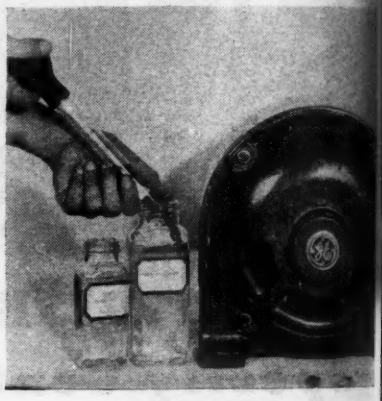


1 Wipe clean the housing, pressure-gun, and relief fittings, and then remove both fittings. Every care should be taken to keep dirt out of the bearings, both when greasing and cleaning them. A bit of abrasive once in a bearing may not be removed even with the most thorough cleaning. Afterwards, it may become dislodged and get between the bearing surfaces with serious results.



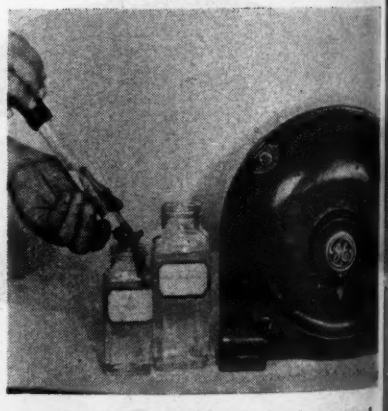
2 With a clean screw driver or a similar tool, free the pressure-fitting hole in the top of the bearing housing of hardened grease. Also, free the relief-plug hole in the bottom of the housing from old grease to permit easy expulsion of the old grease during the cleaning process.

5 Replace the relief plug and inject solvent until it can be seen splashing in the filling hole. Allow the solvent to churn for a few minutes. Remove relief plug and drain. Repeat the churning operation until the solvent runs clean. (Below)



3 Fill a syringe with grease solvent and inject some of it into the bearing housing through the pressure-fitting hole, while the motor is running.

4 As the grease becomes thinned by the solvent, it will drain out through the relief hole. Continue to add solvent until it drains out quite clear.



6 If carbon tetrachloride has been used for flushing, replace the relief plug and inject a small amount of light lubricating oil. Allow it to churn for a minute or two before draining off. This will flush out the solvent. To complete the job, grease the bearing with the proper type grease.

Information from General Electric Company

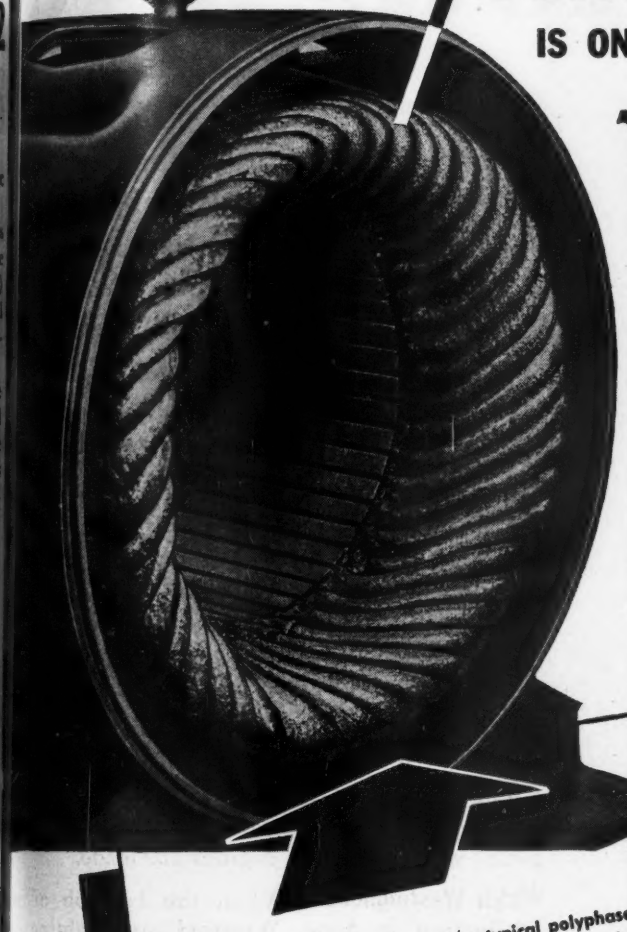
WAGNER PRODUCTS SPEED VICTORY!

THOROUGH INSULATION

IS ONLY ONE OF THE MANY REASONS WHY

Wagner MOTORS

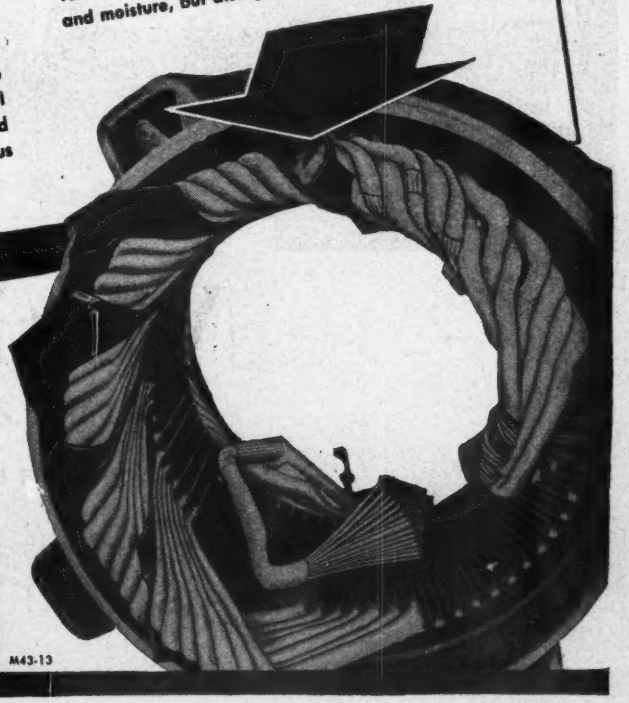
Stay on the job!



All Wagner motors are built to exacting specifications, and embody characteristics and features that give them long life, dependability and added protection against failure. Wagner engineers will not compromise on "good enough" insulation — all windings must be thoroughly insulated. This is only one of the many reasons why Wagner motors stay on the job.

The illustrations on this page show typical polyphase stator windings. The stator cores of all Wagner polyphase motors are well insulated, using special slot cells formed from tough fibrous material, cuffed on each end for extra strength. The coils and free ends are shaped to fit snugly into the slots so that there is no possibility of vibration and at the same time the windings are easily put into place. Heavy separators are used between the coils in the slot and inverted U-shaped cells fit over the tops of the coils under the slot wedges. The free ends of the windings are completely taped well into the slot cells, and heavy sheets of black varnished muslin are slipped between the coils of the various phases to insulate them from each other.

After the windings are in place, the stator is baked to remove all moisture, and while still hot it is immersed in a heavy insulating varnish. When the heated stator core is immersed in the much cooler varnish a suction is created which produces complete impregnation of the windings. The stator is immersed long enough so that the insulating varnish impregnates the innermost portions of the coils. The stator is then baked again until this coating is completely dried. It is then given another dipping and baking to insure complete impregnation and to provide an added moisture-resisting coating. Finally, the stator is sprayed with air-drying varnish, which not only provides further resistance to oil and moisture, but also gives the coils a glossy surface.



WRITE FOR COMPLETE INFORMATION

Complete information on Wagner motors will be sent upon request. Wagner is a nation-wide organization with branches in twenty-nine principal cities. Each branch office is manned by trained field engineers ready to help you solve your motor-drive problems.

Wagner Electric Corporation
ESTABLISHED 1891
6413 Plymouth Avenue, St. Louis, 14, Mo., U.S.A.
ELECTRICAL AND AUTOMOTIVE PRODUCTS

M43-13

Power enough to

Nearly 1,000,000 horsepower per day! That's the growing might of America's air-power! Engines are safer too, more reliable . . . built to higher standards in plants equipped for better "See-ability."

Engines today are incredibly precise!

They are built to standards of perfection that m fine watches seem crude. Mechanical failure almost unheard of.

Modern improved lighting—better "See-ability" everyone—helps make this possible.

With better "See-ability", technicians more efficie explore materials for hidden flaws . . . machi operators work to closer limits, turn out parts fas Inspectors too do their work better.

Brighter, longer-lasting than ever before, toda Westinghouse Mazda Lamps light many of t plants where airplane engines are made.

Watch Westinghouse! When the big job of w production is done, Westinghouse lighting i provements will again be available for factori offices, stores, homes. Many advances in design, a construction have already been made; drama improvements are in the offing. Recommend We inghouse Mazda Lamps for better "See-abili Westinghouse Electric and Manufacturing C Bloomfield, N.J. *Plants in 25 cities... offices everywhe*

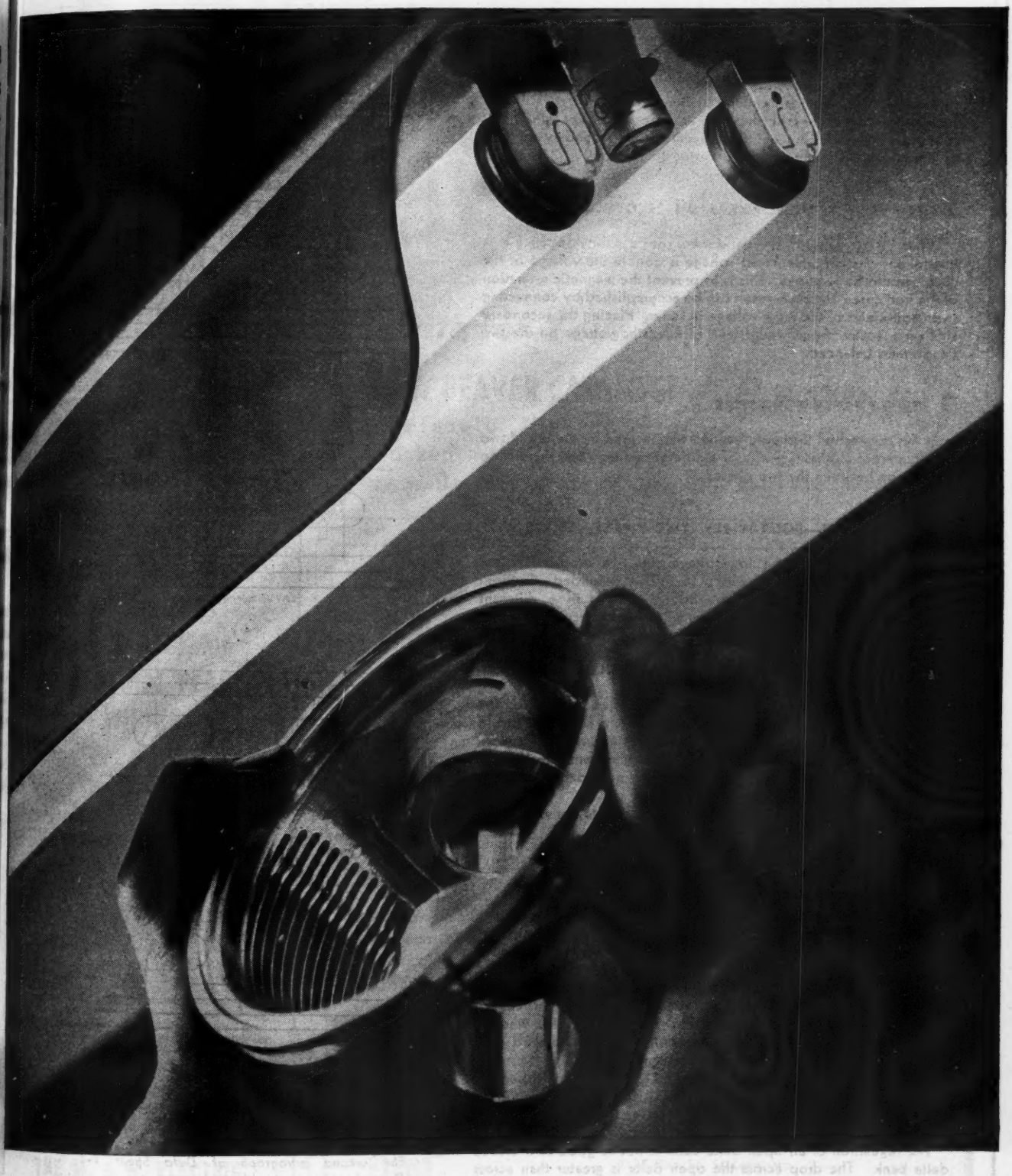
Photographs, courtesy Wright Aeronautical Corporation, Paterson,

Westinghouse

MAZDA LAMPS

FOR BETTER "SEE-ABILITY"

sweep the skies



★ LET'S ALL BACK THE ATTACK . . . BUY *MORE* WAR BONDS ★

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index.

T-3

Transformer Connections

1 STANDARD TRANSFORMER AS BOOSTER

The purpose of a booster transformer is to raise the voltage of the circuit from which the transformer is excited. The primary winding is connected in multiple with the line, and the secondary winding is connected in series with the line. By reversing the secondary winding its action can be changed from boosting to bucking.

2 60-CYCLE TRANSFORMERS ON 25 CYCLES

When using a 60-cycle transformer on a 25-cycle circuit, a transformer whose normal rated voltage is double the voltage of the circuit would be required. This is to prevent the magnetic saturation of the iron core. The same result can be accomplished by connecting two transformers of the same voltage in series. Placing the secondary side on a 3-wire circuit would tend to keep the voltage on the two transformers balanced.

3 TWO-PHASE—FOUR-WIRE

In this connection 2-phase, 4-wire is transformed by the use of two transformers to 2-phase, 4-wire of a different voltage and there is no connection between the two phases.

4 TWO-PHASE—FOUR-WIRE: TWO-PHASE—THREE-WIRE

The two phases on the low-voltage side are electrically tied together. The common third wire is sometimes grounded. Caution: If in the load the two phases are inter-connected in a different manner than here shown at the transformers, a short circuit will result.

5 TWO-PHASE—THREE-WIRE INTERCONNECTED

In this connection two phases are electrically tied together by the common third wire. This is permissible in certain cases and not in others. This third or common wire is sometimes grounded. Caution: If the generator or any transformers back of the transformer group shown here are interconnected in a manner not identical to the transformer bank, a short circuit will result.

The same applies to the load on the secondary side, for example, a motor.

6 THREE-PHASE—OPEN DELTA

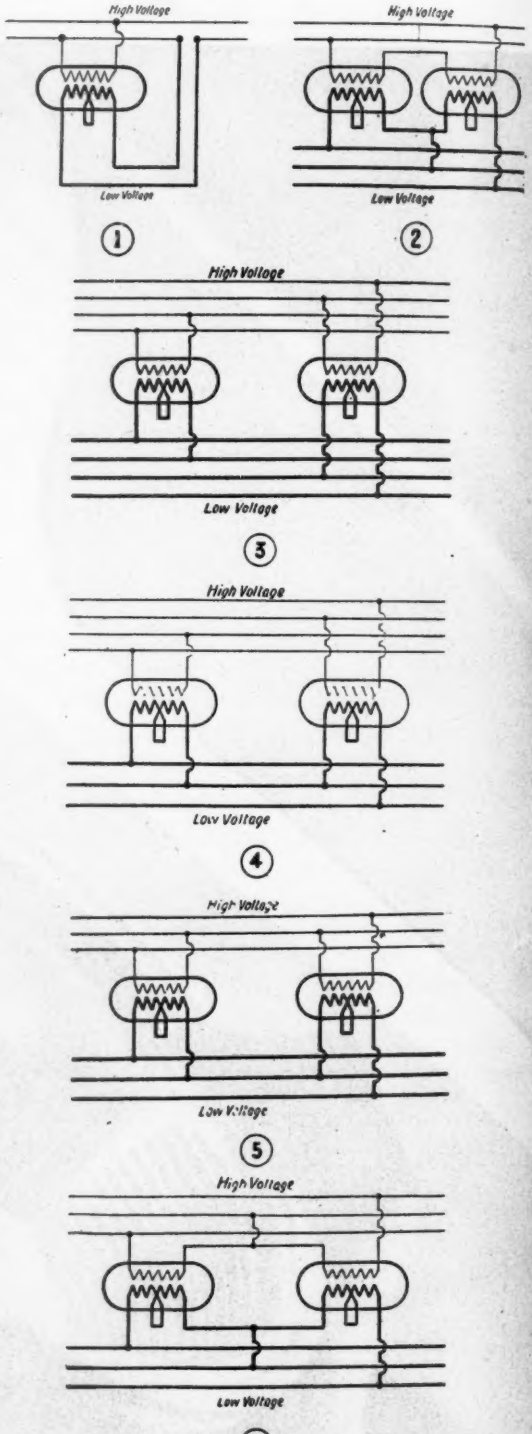
Three-phase to 3-phase may be transformed by the use of two similar transformers in open delta. In this connection the units will transform 86 percent of their rating, i.e., two 100 kva. units in open delta transforming 3-phase, 2300 volts to 3-phase 230–115 volts will have a bank capacity of 172 kva.

In the open delta connection it is not necessary that the impedance characteristics be the same, although it is preferable, for when it becomes necessary to close the open delta bank with a third unit, then all three units must have identical impedances.

The open delta connection is often used as a temporary expedient pending a contemplated increase of load. Note that by adding a third 100 kva. unit in the example shown here, the resultant bank capacity will be increased from 172 kva. to 300 kva.

The regulation of an open delta bank is not as good as a closed delta bank. The drop across the open delta is greater than across each of the separate transformers.

Information from Westinghouse Electric & Mfg. Co.



CORRECTION

The second paragraph of Data Sheet T-1, December issue, should read:
"Transformers to be operated in parallel must not only have the same voltage ratio and the same impedance value but also must———etc."

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

READER'S QUIZ

FLUORESCENT LAMP BALLAST

QUESTION 119. The manufacturers of fluorescent lamps have designed a single phase ballast which will operate four 100 watt lamps and is designed to operate from a 265/480 volt Y power supply system. The obvious advantages of saving material are, of course, at once apparent.

I would like to know your readers' experience as to how this ballast could be used advantageously where the company has the customary 115/230 volt single phase lighting service in capacities of one to 10 kw. What is the easiest and best method to secure this 265 volt?—M.A.H.

A. TO QUESTION 119. Stable operation of fluorescent lamps require that voltage drop in the ballast be almost as great as voltage drop in the lamp. The voltage rating of the 100 watt lamp is 74 volts. Two in series have a drop of about 148 volts. The four lamp ballast was designed to take advantage of the fact that sufficient voltage to operate two 100 watt lamps in series is available (phase to neutral) from a three phase 4-wire wye 440 (nominal) network system or power transformer bank and that such set-ups are fairly common.

When 4 wire wye 440 volt (nominal) supply is furnished the voltage ratios are usually within the limits of 254/440 to 277/480 volts. The phase to neutral voltages within these limits will satisfactorily operate two 100-watt lamps in series, and essentially a four lamp ballast is simply a modified two lamp ballast having two lamps in series on each leg. Incidentally, the voltage ratio stated in the question is incorrect. 265 volts phase to neutral will be accompanied by 460 volts phase to phase.

One manufacturer's literature states that the application of the 4 lamp ballast is "confined to a Y connected network distribution rated at 254/440, 265/460, and 277/480 volts". This statement does not seem to be entirely correct. Network distribution is not required nor is it essential that the supply be wye. It so happens however that the required circuit voltage for two 100 watt lamps in series is usually available only where 4 wire wye 440 volt (nominal) network is used or where such supply is furnished for an individual establishment.

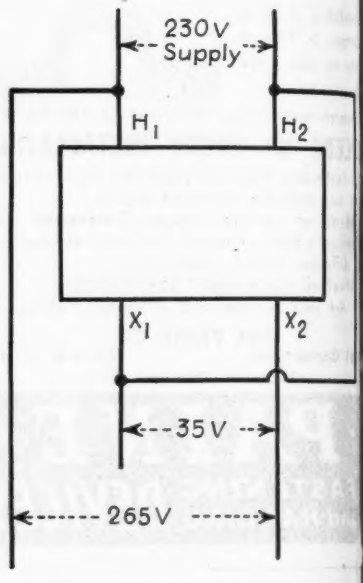
Many distribution type transformers of the 115/230 volt secondary rating can be tapped up to supply at least 128/254 volts. It might be perfectly possible to increase the voltage of your lighting service but I strongly advise against it. The non-standard voltage would create trouble in all other equipment connected to it and you would have no neutral wire in the 254 volt supply to your four lamp ballasts.

The best way of obtaining the desired voltage (and this probably would not be economical) is to use auto-transformer set-up from 115 and 265 volts (or thereabouts) carrying the neutral of this 115 volt supply through as the common lead. Probably the best thing to do is to make no attempt to use the four lamp ballast in your situation. It seems to have been developed primarily in view of the fact that sometimes in some places there are standard voltages which make its use highly feasible.—D.J.F.

A. TO QUESTION 119. In order to procure the necessary 265 volts from the customary single phase, 3-wire 115/230 volt service, proceed as follows:

Procure a transformer of the correct kva. rating to handle the desired fluorescent load, and with a high voltage or primary winding for 230 volts and a secondary or low voltage winding of 35 volts or a ratio of approximately 15 to 1.

Connect the two windings H_1, H_2 and X_1 and X_2 in series, i.e. connect H_2 to X_1 as per the diagram, and then connect the high voltage winding H_1 and H_2 to the 230 volt source of supply. With a voltmeter take a reading between the free primary and secondary leads H_1 and X_2. The reading will be the sum of the voltages of the two windings for an additive polarity or the difference of the voltages of the two windings for a subtractive polarity, as in sketch above.



Should the first method of connection prove to be subtractive then interchange the X_1 and X_2 leads, i.e. connect H_1 to X_2 which will then give an additive polarity or a reading of 265 volts between H_1 and X_1.

If a correct ratio of transformer is not available then have the utility change the primary taps on the existing distribution transformer to the nearest secondary voltage which will give, in conjunction with your available transformer, voltage approximately 265 volts—G.S.P.

A. TO QUESTION 119. Two hundred and sixty-five (265) volts can be obtained by using a small booster auto-transformer of the sign lighting type. They are rated 120/240 12/14 volts. By connecting the output to boost (not buck) 253 volts may be obtained from a 230 volt supply or 265 volts from a 240 volt supply. Either voltage is adequate for this ballast. Since the neutral is not used, the fixture would have to be grounded separately. We considered using this system on a relighting job but found that it was more expensive and used more material for equal light output than one designed for 40 watt lamps. The auto transformer more than offset the saving on the single ballast. Because the system voltage

only 10 percent higher, very little, if any, reduction can be made in conductor sizes. Finally the lumen output per watt of the 100 watt lamp is about 19 percent less than that of a 40 watt lamp. —W.A.P.

POLARITY REVERSED

QUESTION 120. We have a 500 amp. 2–6 v. plating generator and on several occasions the polarity has become reversed for no apparent reason. When this happens I swap the wires at the plating tank and the plating is continued. I'd like to know what causes this trouble and what I must do to stop it?—J.A.B.

A. TO QUESTION 120. From what I gather J.A.B. surely must have a self-excited generator which, if so, will continue to give him trouble from time to time. Most all self-excited generators will reverse polarity. He will correct his trouble when he removes his exciter circuit to a separate source. Belt or gear an exciter of proper voltage to the present plating generator. J.A.B. should take a volt meter reading of his present exciting circuit and replace it with one as near as possible. There should not be greater than a plus or minus 5 percent difference in voltage. With a constant field excitation, the voltage will drop slightly from no load to full load because of armature drop and armature reaction.—K.C.C.

A. TO QUESTION 120. It seems probable that the generator is operating with a weak field. In such a case operation will be unstable, voltage will decrease rapidly when the field current decreases, and if the field should open the effect of the armature reaction might be sufficient to reverse the field. Strengthening the field and reducing the speed should help. I would check for a possible loose connection in the field circuit which might result in the trouble indicated.

If a separately excited generator were available it should be more stable in operation and so more satisfactory.—J.E.W.

A. TO QUESTION 120. Use an outside source of field excitation, and your troubles will be over. CAUTION: Be careful when opening field circuit.—H.S.

A. TO QUESTION 120. A reversal of polarity can quite often be caused by a discharge of the plating solution back through the machine. In some cases a plating tank will have a pretty

good charge and will then act as a storage battery unless the plating generator is entirely disconnected from the load when shut down.

I would suggest, as a remedy, that a shot of current from an outside source be put through the machine in the right direction, when necessary to avoid having to change connections. A storage battery will probably serve very well for this purpose.—R.L.M.

INDUCTION GENERATOR

QUESTION 121. We have a 240 kw. gas engine driven induction generator to reclaim power which would otherwise be wasted. This power is about 10 percent of the plant demand. Should the feeder from the power station fail, the entire plant including the generator would be inoperative.. The especial hazard would be the rapid cooling of our incinerators which would seriously damage the refractories. Normally three days on gradually reduced oil fire is required to cool the incinerators at a safely slow rate. What equipment would be required to excite the generator so that it could be used as an independent source of electric power sufficient to operate the auxiliaries needed to cool down the incinerators? Could the voltage and frequency be satisfactorily controlled manually? (The gas engine speed is controlled by a sensitive governor).—G.I.S.

A. TO QUESTION 121. An induction generator can be used only in parallel with some synchronous generator. If the synchronous generator fails or the circuit is interrupted, the induction generator will have no excitation. For emergency a small synchronous alternator could be driven by the same gas engine and provide the excitation for the other generator. If the load is steady and engine speed is constant, it should be possible to govern the voltage and frequency satisfactorily.

If the power required for the auxiliaries is not too great, perhaps it would be well to have a separate alternator and disregard the induction generator while the regular source is out of service.—J.E.W.

A. TO QUESTION 121. Your induction generator will not function as an entirely independent machine. Its operation depends on the presence of a field in the stator windings and this must come from an external polyphase source such as a supply system or power plant having synchron generators. The voltage regulation frequency are dependent upon the v age and frequency of the polyphase s tem in parallel with which your ind tion generator operates.

As a practical matter, the only w in which you can operate your genera independently of a utility or power s tion connection is by installing a s chronous generator to supply excita and by obtaining voltage and freque regulation through control of this s chronous generator. It would be po ble to keep this synchronous genera down to a rather small size if capaci were installed as a supplement. T total kva. of the exciting set-up must at least 25 percent of the kva. load the generator. It is usually not econo ical to install this amount. If the lo is almost all synchronous motors, a this is probably not the case, it is a theoretically possible to operate us capacitors only.—D.J.F.

A. TO QUESTION 121. An indu tion generator must be operat in parallel with synchronous generato The synchronous machines will "set" t voltage and frequency of the system a must be large enough to supply t wattless component of the load and t induction generator.

Since no constants of load or charac teristics of generator were given, hypothetical problem will be solved t illustrate the method of choosing t synchronous generator.

Assumed: Emergency load of 250 k at 70 percent power factor and inducti generator rating of 240 kw. at 80 perce power factor. What rating will be r quired of a synchronous generator t operate with the induction generator

	Load	Induct Generat
Kilowatts (given and assumed)	250	240
Power factor (assumed)	70%	80
Kva. (kw ÷ power factor)	357	300
Reactive factor ($\sqrt{100\%^2 - P.F.\%^2}$)	71.4	60
Reactive kva. (wattless component) kva. x r.f.....	255	180

The reactive kilo-volt amperes r quired of the synchronous generat would be 255 + 180 = 435. This the wattless power required by the lo and to excite the induction generato The active or kilowatt component r quired of the synchronous generator 10 kw., being the difference between t load and the power supplied by the in duction generator. The nearest choi of a synchronous generator would prob ably be 450 kva.

To supply the losses and excitation of the synchronous machine and the useful power it will deliver, an engine in the order of 85 horsepower would be required. The frequency of the combined system could be controlled by the governor of the 85 hp. engine. The voltage of the combination would be controlled, as convenient, by the synchronous generator.

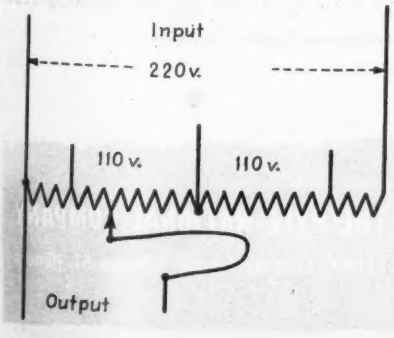
Right away, without considering necessary transformers, foundations, exciters, etc. it will be noted that this will be an uneconomical installation. The only advantages for an induction generator are that it need not be synchronized, that it has fewer parts and auxiliaries, and that it will not jar the system under short-circuit conditions. Induction generators are economical only if their combined capacities are small compared with the rest of the system.

The answer to this particular problem would lie in a duplicate source of power from the power station or a synchronous generator of sufficient size to handle the blowers and controls on the incinerators. —L.E.B.

A. TO QUESTION 121. If the feeder from the power station fails, your induction generator becomes inoperative and there is no equipment you can add to excite the generator so that you can use it as a source of power. Why? Because induction generators depend for their excitation upon lagging current from synchronous generators, or leading current delivered to synchronous motors. If it is necessary for you to have emergency power I would suggest a synchronous generator for your gas engine.—V.M.

Can you ANSWER these QUESTIONS

QUESTION W4. I am contemplating building an auto-transformer with variable taps to be used for intermittent testing purposes. I want it suitable for the nominal 110/220 volt range on 60 cycle and with maximum output in kva. within 25 percent above or below normal input voltage. I have the core and want some good practical sug-



gestions on the design of the winding.

The core is a rectangular stacking of L shaped punchings and has a cross section of approximately 10.5 square inches with a magnetic path having a mean length of about 26 inches.

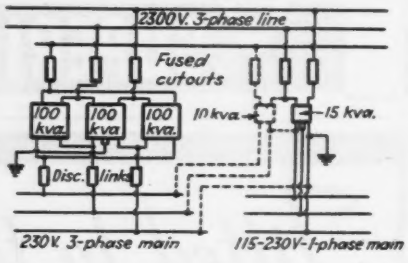
I plan to hand wind from a bobbin around the core with a single layer so that the large number of taps will not be a problem.

Efficiency and continuous rating is not a factor due to the loadings being for a short period. Would a few turns energized at low voltage give any data if current and voltage were measured? This should give an indication of the turn voltage and magnetizing current required, but how about percent impedance and wire size? The winding connections will be as shown on the above elementary diagram.—E.J.K.

QUESTION X4 Our load is seasonable. Five to seven months each year the connected load is 350 hp. of motors the largest of which is 30 hp. The remaining months the power load never exceeds 20 hp. The lighting and small single phase load is about 20 kw.

Our service is 2300 volt delta metered primary to 3–100 kva. transformers for 3 phase 230 volt power and one 15 kva. transformer for 115–230 volt single phase. Connections are as per solid lines in the sketch.

In order to reduce transformer losses during the off season period we propose to



install a 10 kva. transformer in open delta with the present 15 kva. transformer and switch off the large bank on both primary and secondary, by means of connections as per dotted lines in the sketch.

The question is: Will we run into any trouble trying to run the little open delta bank in parallel with the large closed delta bank?

Certain of our equipment is such that it would be undesirable to interrupt service for even the short time required to switch from one bank to the other.—T.W.J.

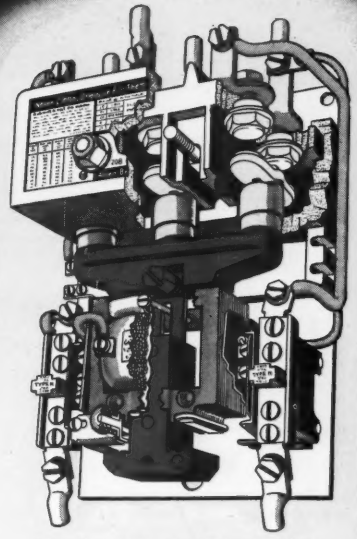
QUESTION Y4 I have a 60 volt d.c. compound-wound motor which I desire to convert into an arc welder. In using two six-volt storage batteries in series (12 volts) as an exciter across the fields, I find that I can melt fairly large rods. But in using a ½ hp. 125 volt d.c. motor with an output of four amps., I get only light sparks on the welding rods. In order to use this small motor as an exciter, what shall I do to the motor I'm using as a welding generator? If your answer involves rewinding of the fields, etc., give a formula for computing the number of turns, size of wire, etc.—D.A.

PLEASE SEND IN YOUR ANSWER BY FEBRUARY 1

WARTIME HAS NO TIME for CONTACT MAINTENANCE

Copper contact before and after 50,000 operation life test. It was necessary to replace contact.

A-B silver alloy contact before and after same test. Contacts were still good for thousands of operations.



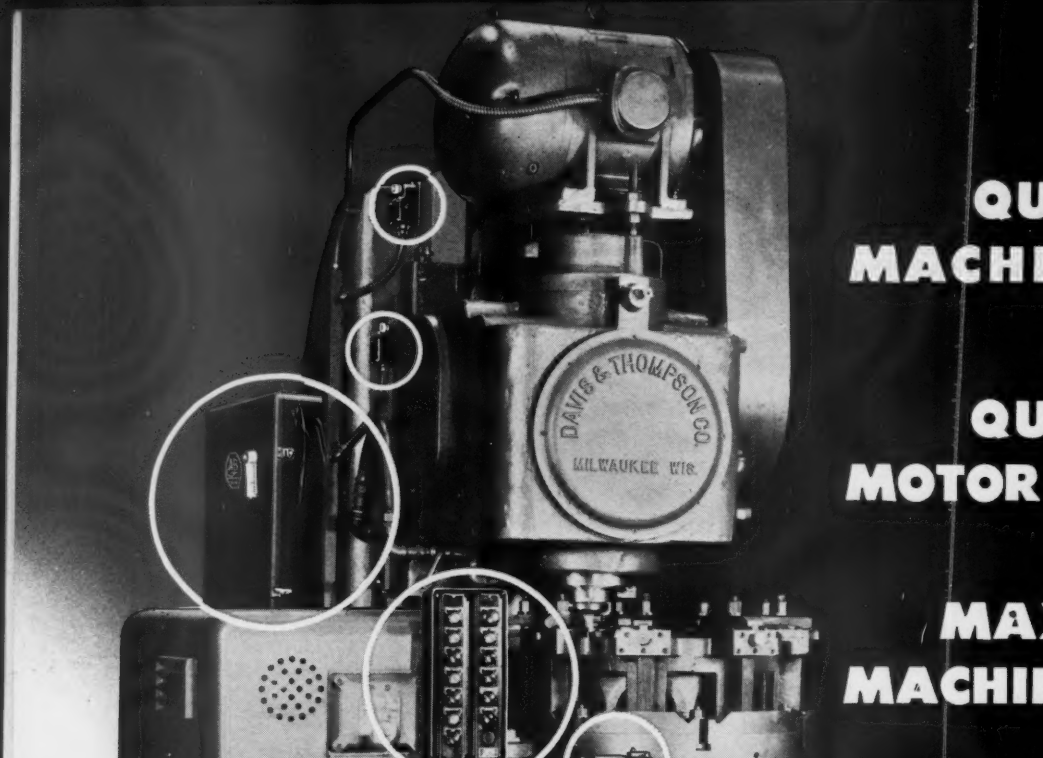
The solenoid plunger—shown in red—is the only moving part of the A-B starter.

War plant machinery needs the freedom from contact maintenance that is part of Allen-Bradley trouble-free motor controls. A-B solenoid starters have patented, double break, silver alloy contacts which are good for millions of operations. They never need cleaning, dressing, or filing. The oxide which may form on them is a good electrical conductor and therefore low contact resistance is always assured. When you're making replacements or buying new motorized equipment, be sure to specify trouble-free Allen-Bradley motor controls. Write today for Bulletin 709.

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR STARTERS

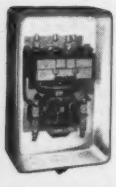
QUALITY



QUALITY MACHINE TOOLS + QUALITY MOTOR CONTROLS = MAXIMUM MACHINE OUTPUT

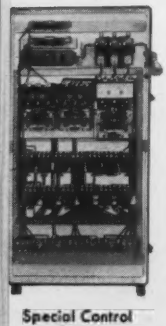
Relay

Limit Switch and Precision Limit Switch



Across-the-line starter

Push Buttons



Special Control Panel

Your guarantee of highest efficiency from operator and machine is to use Allen-Bradley controls for automatic sequence operations. Oscillograph tests show that A-B solenoid controls close in short, uniform pick-up intervals which assure consistent switching performance. No other magnetic controls provide such split-cycle accuracy which saves time and increases the production of your machine.

There's no time lost for maintenance either. A-B double break, silver alloy contacts never need filing, cleaning, or dressing. With only one moving part, there's nothing to get out of order. A-B controls are an asset to any machine.

Allen-Bradley Company, 1316 S. Second St.
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ALLEN-BRADLEY

AUTOMATIC MOTOR CONTROL

MOTOR SHOPS

EVOLVING YOKE PEEDS WINDING

Electric Motor and Repair Company Richmond, Virginia, has developed small armature winder that has in-eased winding speed considerably. The portant part of the assembly is, of urse, the yoke (see accompanying otographs).

An 11-inch span is provided at the outh of the yoke. A piece of ½-inch by inch cold-rolled strap steel bent into U-shape does the trick. Each end of e yoke is slotted. Into the slot on one d is placed a hinged chuck that swings a small pin. The chuck is merely a be of steel drilled to accommodate the mature shaft. At right angles to this le, another is drilled slightly off center d accommodates a notched brass dog ed to tighten the armature shaft in the uck.

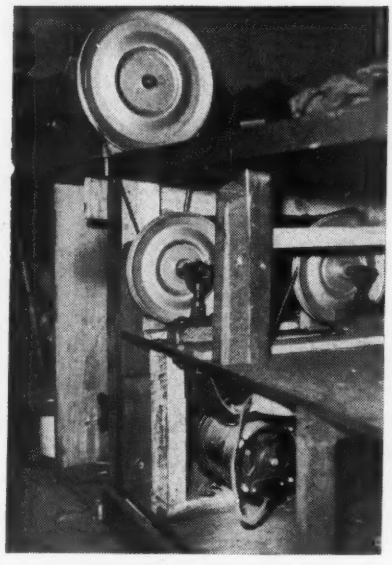
The slot on the opposite end of the ke holds the other end of the arma-re shaft. A hinged hook snaps shut d the armature is securely held in the ke, ready for revolving and winding.

At right angles to the plane of the yoke arms, is another arm bent on an arc and welded to its vertex. This arm is made from a length of ¼-in black iron and used to loop the finish-and-start of each coil to the correct lead length to avoid wastage. In this way the entire armature is wound in one continuous length. Leads are then cut for commutator soldering. A revolution counter is provided to count the number of turns.

The operator controls the speed, start and stop by a foot pedal. Wire reels are placed behind him, while he winds with the use of a hand fiber tension block. Top speed of the yoke is 190 rpm. and by operation of the foot pedal (which operates a friction clutch) any speed from zero up to that maximum is obtainable.

The yoke is drilled at the vertex and the driving shaft is inserted and welded. Two small outboard bearings are mounted on a 13-inch length of 6-inch channel iron and carry the main drive shaft. On the opposite end of the shaft from the yoke is the large drive pulley.

Three stages of speed reduction is accomplished through the use of belts, pulleys and outboard bearings. The small driving motor is a ½ hp. single phase induction motor rated at 1740 rpm.



***THREE STAGES** of speed reduction are obtained by this arrangement of pulleys. All bearings are of the small outboard type. Resulting yoke speed is 190 rpm. Driving motor is rated at 1740 rpm. Friction clutch, actuated by operator's foot gives any speed from zero to maximum. Foot pedal can barely be seen to left of motor.*

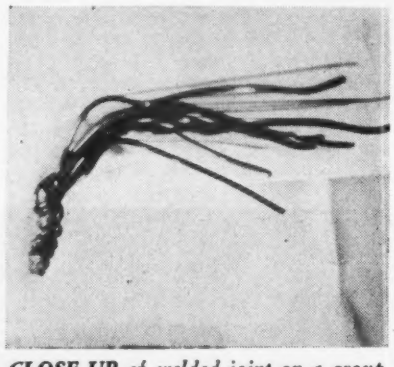
***WINDING YOKE** designed to speed small armature winding. Shaft, on commutator end, is securely held in the hinged chuck by a notched brass dog. Other end of shaft is held in slot by a hinged hook. Start and finish of each coil are looped over an extending arm set to give the correct lead length and thus avoid wastage.*

WELDING SPEEDS COIL CONNECTIONS

Bodine Electric Company, motor service shop of Decatur, Ill., has solved the rather perplexing problem of quickly skinning the insulation from "formvar", "formex" and similarly insulated magnet wire to make coil connections on rewound motors. Previously, each conductor was laboriously denuded of its insulation—requiring considerable time if a thorough job was to be done.

The unique method devised by the Bodine shop is to leave the insulation intact and let heat do the job while simultaneously making a good electrical connection. An ordinary acetylene welding torch with a closely controlled small flame does the trick. The coil ends are tightly twisted together in pigtail fashion and the torch applied. The heat of the torch removes the insulation and makes a solidly welded copper joint which can then be taped. Heat alone is sufficient to do the job on conductors up

WELDED ELECTRICAL CONNECTION is made with an acetylene torch in a shop test at Bodine Electric Co., where the principle is used on motor coil connections. For large wire sizes, Silfos rod is employed.



CLOSE UP of welded joint on a group of eight lengths of No. 8 "formvar" insulated magnet wire.

to No. 12 in size. From No. 12 on up (Nos. 10, 8, 6, etc.), Silfos rod—a low temperature bronze and silver alloy—is used to produce a welded ball on the end of the pigtail. The oxygen-acetylene ratio used was about two to one (3 lbs. oxygen to 1½ lbs. acetylene).

Some time studies made at the shop indicate a considerable saving in labor. For example: it took ¼-minute to make a welded connection on four or five No. 12 conductors twisted together; about four hours were saved just on making connections on a 50 hp. motor. These studies were compared with the conventional method of skinning and tinning the conductor and soldering the joint.

The same method was used on a set of No. 3/0 insulated conductors on an emergency industrial feeder job. Work-

ing space was limited and the cable had to be repaired in a hurry to maintain plant operation. Proper size solderless connectors were not available. An acetylene torch with a small flame, to prevent burning the cable insulation, and the Silfos rod were employed. About 20 minutes time was required to make three complete connections. The circuit was made "hot" immediately after the job was finished and no future trouble was encountered at the joints.

Shop tests on such welded connections indicated that when the conductors were subjected to tension and twisting stresses the cable strands themselves would weaken and break, but the welded joint remained intact.

NO. 3: COMPARISON OF POLARITIES WITH MAIN OR COMMUTATING COIL ON VERTICAL

By A. C. ROE
Design Engineer
Westinghouse Elec. & Mfg. Co.

In this third article on field coil polarities, they are compared on the basis of each being placed on an arbitrarily chosen center line.

To establish a basic main pole of north magnetic polarity, the current must flow around the pole in a counter-clockwise direction—or in a direction opposite to that of the south pole. This is based on the observer standing facing the front or commutator end of the machine, see Fig. 2 (a) and (b). The current should enter the coil at the right of the coil center line for open coils, as in Fig. 2 (a). For crossed coils, the current should enter the coil on the left of the coils' center line as in Fig. 2 (b). This again is opposite to the rules for south poles.

The coils shown in Fig. 2 (a) and (b) have the leads on the commutator end and the lead of the coil used for the "in or D lead" may be either the starting or finishing lead of the coil.

With a start-on-right coil arranged for counter-clockwise winding, the lead D in Fig. 2 (a) and (b) would be the starting lead of the coil and would be on the armature side. With a start-on-left coil arranged for counter-clockwise winding, the lead D in Fig. 2 (a) and (b) would be the starting lead and it would be on the frame side.

With a start-on-right coil and arranged for clockwise winding, the lead D of Fig. 2 (a) and (b) would be the finishing lead, and the starting lead of the coil would have to be on the frame side. With a start-on-left coil and arranged for clockwise winding, the lead D in Fig. 2 (a) and (b) would be the

[Continued on page 102]

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

QUESTIONS ON THE CODE

SWITCHES

Q. *"Should keyless sockets and receptacles be controlled by a switch?"*—H.L.G.

A. The Code does not require that switches be installed to control sockets, receptacles or fixtures whether keyless sockets are used or not. It is left to the requirements of convenience, except in the following cases where switches are required by the sections of the Code indicated:—

Arc lamps (4211);
Receptacles in Class 1 & 2;
Hazardous locations (5023, 5063);
In special locations such as Theatres (5223, 5225, 7031), in film vaults (5307); or Signs and outline lighting (6003).

THERMOSTAT FOR MOTOR CONTROL

Q. *"Can a Honeywell heat control be used to start a motor, or must a magnetic starter be installed? Motors of 5.5 to 10 amps.—220 volt"* —H.L.G.

A. According to the Underwriters' Laboratories' List of Inspected Electrical Equipment, the Minneapolis-Honeywell Regulator Co. have listed thermostats up to 1 and 1½ hp. These could, of course, be used for controlling the motors.

CIRCUIT DISCONNECTING MEANS

Q. *"In a 220 volt 3 phase installation being served by a delta connected service with one leg having more than 150 volts to ground, would the method of installing several fused branch circuits, under the control of a single disconnecting means, violate Section 2440 of the 1940 Code?"*—E.J.McE.

A. The statement of the condition "with one leg having more than 150 volts to ground" indicates that the mid point of one phase is grounded, this phase probably being used for lighting.

Under the condition of one leg having a potential of more than 150 volts to ground, Section 2440 requires that all fuses in each individual circuit containing the ones which are at more than 150 volts to ground, be so arranged that they can be independently disconnected from all sources of energy. Note that this rule speaks of "each individual circuit" and consider what this means. In the lighting circuits which are taken from the phase having the mid point (neutral) grounded, this rule would not apply as the voltage to ground of either phase wire of this phase, is less than 150.

This section then, would generally apply only to power circuits under the above condition, using all 3 phases. Then the rule requires that each individual (branch) circuit have a disconnecting switch ahead of all of the fuses or thermal cutouts on the circuit; that is, one switch at least at the source of supply to each circuit. If the motor at the end of this circuit, is within sight of this switch, this switch may also be the disconnecting means for the motor; or, if this switch also meets the requirements for controllers and disconnects all of the wires, as specified in Section 4407, and is within sight of the motor, it may be the only switch required on the circuit.

Also note that Section 2440 states that the fuses must be "disconnected from all sources of electrical energy". This is to provide against any possible feed back through the circuit as might be the case where all of the legs of the circuit to the motor, were not broken. Of course the arrangement whereby the fuses are removed from the fuse clips by opening the device, (such as when the fuses are fastened to the door or pull-out of a fuse cabinet), would meet the requirement of this Section.

TWO WIRES UNDER ONE SCREW

Q. *"Where can I find reference to that old violation, 'two wires under one terminal'?"*—H.L.G.

A. The old rule which was involved to require the soldering together of two wires put under a single terminal screw, was found in Paragraph 203c of the 1933 Code and in previous Codes. This required that "stranded conductors other than flexible cords, shall be soldered together at their

***LAB SESSION** in electronics, at the Illinois Institute of Technology, gets the undivided attention of Chicago electrical contractors (L to R) Leo Witz, A. F. Smith, Al Oppenheimer, and T. F. Kisken.*

SAVE BOTH GUESS AND WORK
IN INDUSTRIAL ELECTRICAL CIRCUIT PROTECTION

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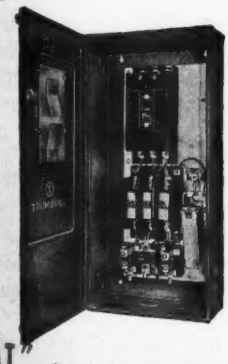
NOTHING TO RENEW **"AT"** NOTHING TO REPLACE

"AT" Enclosed Industrial Circuit Breaker, 15-600 amp.

M-1 and M-2 Industrial Multi-Breakers, 15-100 amp.,—230V. AC only.



"AT" Circuit Breaker Disconnect in Combination Motor Starters. Sizes, 0, 1, 2, 3; 15 to 225 amp.

"AT" Circuit Breaker Panelboard.

- **ENCLOSED INDUSTRIAL CIRCUIT BREAKERS†**
- **CIRCUIT BREAKERS WITHOUT ENCLOSURES**
- **CIRCUIT BREAKER PANELBOARDS**
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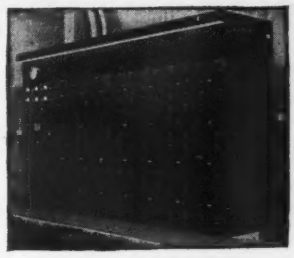
- A comprehensive line built around a single basic operating unit . . . the Trumbull "AT" Breaker unit.
- Designed to keep plant power and lighting circuits ALIVE . . . to act quickly in case of overload or short circuit . . . and to restore service just as quickly when trouble has been corrected . . . with nothing to replace or renew.
- 15 to 600 amp.;—125 to 600V. AC or 125 to 250V. DC;—2 and 3 pole, (15 to 50 amp. available in single pole). Also with solid neutral, 2 pole 3-wire, or 3 pole 4-wire.
- Quick-Make and Quick-Break.

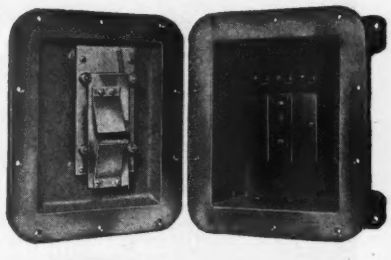
† Available also in cast iron, water tight (NEMA Type 4) and explosion proof enclosures (NE Code Class 1 Group D).

TRUMBULL

CIRCUIT BREAKERS



"AT" Circuit Breaker Switchboard.



"AT" Circuit Breaker in explosion proof enclosure.

"AT" Circuit Breaker Unit for all applications.

Illustrated and described in Trumbullaid Circulars Nos. 309, 314, 315, 318, 321, 325, 330 and 333, available on request.

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ends" and two or more wires connected under a single terminal screw are considered as a stranded conductor.

The present requirements are found in Sections 1116 and 3009. In effect these signify that if the two or more wires are twisted together before being put under the terminal screw, they therefore constitute a splice, which according to 3009, must be soldered unless an approved splicing device is used; or section 1116 can be followed in that pressure connectors or soldered lugs used or, as these wires are generally smaller than No. 8, clamps or terminal plates having upturned lugs or terminals approved for connecting more than one conductor, may be used.

A washer placed between the two wires would meet the requirements of this section as then each wire is separately secured in place.

SPLICING NON-METALLIC CABLE

Q. *"Is it permissible to split a non-metallic cable, connect it to the wires in knob and tube work and drop the remainder of the cable between the wall, just as if it was in loom? I was checked on this practice and told that I had to make my connections in the outlet box. But as this was an old installation and had no boxes, I thought I was perfectly safe in my work."*—M.Z.

A. Section 3014 of the National Electrical Code requires that a box be installed at each junction point of conduit, electric metallic tubing, surface metal raceway, armored cable or non-metallic sheathed cable.

Concealed knob and tube work is not included in this requirement but non-metallic sheathed cable is. So the use of the latter requires the use of a box at a junction point; Section 3713 requires that junction boxes be accessible.

Therefore the practice described in the question would be a violation of the Code rules.

CARRYING CAPACITIES

Q. *"On page 54 of the November 'Electrical Contracting' in your article on 'Carrying capacity', you mention the 80 percent and 70 percent correction factors, for more than three wires in a conduit as given in Note 5, Page 303 of the 1940 Code. Does amendment No. 41 delete these correction factors for the emergency?"*—J.T.

A. Yes, that is true for non-continuous loads for the duration only. However, the tables of carrying capacities of the 1940 Code are still perfectly

good tables and must not be thrown e tirely into the discard, even for the c tion. Of course they will again be in f after the duration and are only held abeyance by reverting to the 1937 C values for conductors which "are operated continuously with maxim currents". Also keep in mind that terim Amendment No. 41 concerns Code grade rubber insulated wires. 1940 tables still apply to all other lations than types R and RW.

It was due to the fact that such small amount of rubber covered w of the larger sizes are being used adays and because practically all of large cables now have insulations o than Code grade rubber, that answered the question in the Novem issue as we did.

INSULATION RESISTANCE TEST

Q. *"What are the insulation requirements for war stand bare neutral non-metallic sheathed ca* —H.L.G.

A. The Code requirements as gi in Section 3018 hold the sa for insulation tests where non-metal sheathed cable of either the prewar of the war emergency type is used.

COLOR CODING

Q. *"Color phase conductors as quired in N.E.C. Section 21 This applies to service feeds for 115-2 volt single phase light service, th wires, No. 1, A.W.G. in 1½-in. cond from service cap to meter, through 100 amp. S.N., disconnect switch to m light panel with the neutral wire ide fied.*

Our inspection bureau says that above section refers only to branch lig ing circuits where common neutral used and does not apply to main serv lines. Which is right?"—A.N.H.

A. Section 2104 deals only w multi-wire branch circuits. T definition of "branch circuit" is given Article 100 as "that portion of wir system, extending beyond the final ov current device protecting the circui This plainly does not include any servi feeder, sub-feeder or main, but o refers to the final branch circuit to wh appliances or fixtures are connected.

The only reference to "color coding other than that in Section 2104 is fou in Section 93846, which states that color markings are used on panel boa or switch boards, they must conform with the color coding of Section 2104.

***The* PARKWAY**
FOR ADMINISTRATIVE AND OFFICE AREAS

Open type fixture for direct or suspension mounting. 4—40 watt lamps.

***The* CRUSADER**
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New type plastic die-formed, stay-put side panels. "Snap-on" body for low cost maintenance, complete "on and off" operation in less than 5 seconds. Direct or suspension mounting. 4—40 watt lamps.

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For single unit or continuous installations. "Snap-on" reflectors for low cost maintenance, complete "on and off" operation in less than 5 seconds. 2—40 watt, 3—40 watt and 2—100 watt lamps.

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ALL WORK AREAS...
REQUIRING HIGH ILLUMINATION EFFICIENCY

Designed to cover a wide range of illumination requirements, these 3 Day-Brite "work-area" fixtures are now available, on priority, for War-plant and Governmental installations... High reflection surfaces are assured by Day-Brite's exclusive "Super-white" baked enamel finish . . . Call your Day-Brite engineering representative for complete details covering these high-efficiency fixtures. Descriptive Bulletins available on request.

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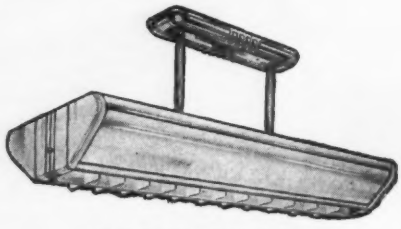
73

COMMERCIAL · INDUSTRIAL and SPECIAL DESIGNS *Nationally distributed through all leading electrical supply houses*

THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed description, sizes, prices and other data write to the manufacturers' advertising departments, tell them in what issue of ELECTRICAL CONTRACTING you saw the item and they will send full details to you

EQUIPMENT NEWS

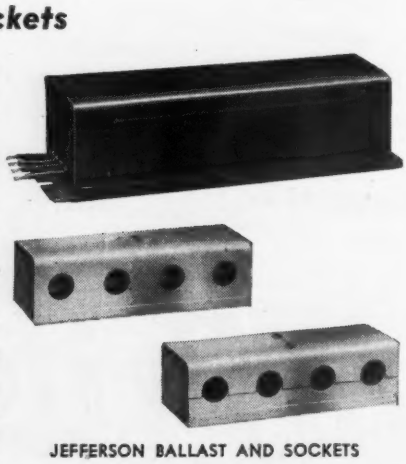
Fluorescent Fixtures



DAY-BRITE "CRUSADER"

Two new fluorescent lighting fixtures, known as the "Crusader" and the "Parkway" have been added to this line. The "Crusader", illustrated, is an enclosed unit available for direct ceiling or suspension mounting. It is made for four 40-watt fluorescent lamps in compliance with the latest L-78 amendment. The chassis is of steel, finished in baked white enamel. The body frame and ends are of wood, finished in ivory enamel with a gray trim. Side panels are of die-formed, stay-put plastic. The entire body is held in place by spring clips. The "Parkway" is an open type unit using the same interior chassis as the "Crusader". Wood ends, finished in ivory enamel with gray trim are applied. It is available for four 40-watt lamps, in direct ceiling or suspension type models. Day-Brite Lighting, Inc., 5411 Bulwer Avenue, St. Louis, Mo.

Ballast and Sockets

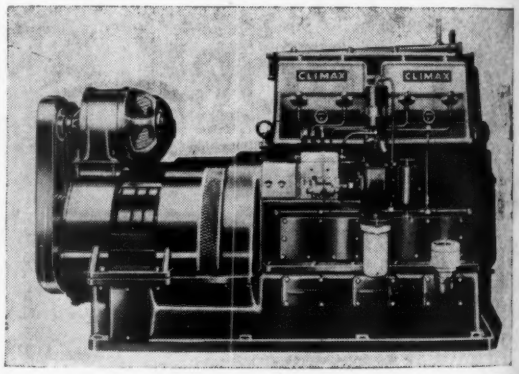


JEFFERSON BALLAST AND SOCKETS

A new ballast which incorporates a transformer, two reactors and a capacitor enclosed in a 2½- by 3⅛- by 9½-in. case has been developed for cold cathode fluorescent lighting. It lights two 40-watt tubes with a power consumption of 105 watts and operates from the ordinary 115 volt alternating current lighting system. The tube connections are made in multiple. Two and four lamp sockets have also been developed which permit the installation of tubing in fixtures or for direct ceiling lighting. One of the sockets has a built-in disconnect switch that opens the circuit when the cover is removed. Placement and replacement of the tubes are made with power disconnected. They are suitable for use in all types of lighting, industrial commercial and residential. Jefferson Electric Company, Bellwood, Ill.

Diesel Engines

Two solid injection, compression ignition engines have been added to this line of gas engines. Both new engines are four cycle, full diesels and intended for use as light plants and primary drives for pumps, compressors, mine equipment, marine service, etc. Model D148 is a two cylinder unit with a maximum rating of 22 hp. It may be equipped for pulley drive with or without clutch and reduction gear or auxiliary power take-off. It may be direct connected, on a single base, with a 15 kva. generator. Model D297 is a four cylinder unit with a maximum rating of 44 hp. Drive equipment similar to Model D148 may be furnished. A flywheel, clutch, generator or marine gears may be installed on either or both ends, providing a radiator is not used. It may be used to power a 30 kva. generator. Climax Engineering Company, Clinton, Iowa.



CLIMAX DIESEL ENGINE

Safety Guard

McGILL GUARD

This new vaporproof safety guard, No. 3007, is free from exposed metal, shockproof and non-sparking. It is light in weight and will float when placed in water. The bulb is covered by a heat and impact resisting, airtight globe, which is protected by a strong fibre cage. The cage is treated to prevent warpage, and is attached to an unbreakable plastic handle. The handle is fitted with a rubber bushing that when squeezed into place by the screw-nut at bottom seals the inside airtight and keeps wire in place. Guard is fitted with a fibre swivel hook for convenient hanging near or on the job. McGill Manufacturing Co., Inc., Valparaiso, Ind.

AN ANNOUNCEMENT OF GREAT IMPORTANCE TO THE BUILDING INDUSTRY

WHAT types of electrical equipment will be needed in the homes of tomorrow?

Where should fixed equipment be placed in kitchens and laundries? How about dimensions and clearances—access for servicing—lighting outlets and controls—utility connections?

Westinghouse has long recognized the need for accurate information on these subjects . . . and for this reason has created the

BETTER HOMES DEPARTMENT

The Westinghouse Better Homes Department was created to assist the building profession in the planning of postwar housing . . . and to give authoritative technical advice on the *proper applications of electricity* which will contribute so much to better living in 194X.

To achieve these ends, Westinghouse has organized the *Better Homes Advisory Staff*, consisting of men of recognized standing and wide experience in the housing field:

IRVING W. CLARK, MANAGER, who has been continuously engaged in housing activities for nearly 25 years . . . a nationally recognized authority on home planning and kitchen design . . . and a Director of Producers Council, Inc.

A. CARL BREDAHL, TECHNICAL DIRECTOR, formerly Chief of the Mechanic-Electrical-Utilities Division of the Federal Public Housing Authority from 1934 to 1943, where he was responsible for establishing design standards of mechanical and electrical installations for U. S. Government housing projects . . . and for 7 years electrical designer for Warren & Wetmore, New York.

JOHN S. VAN WART, REGISTERED ARCHITECT, formerly with Fred F. French Company, New York, who has designed many multiple dwellings, hotels, and institutions during the past 30 years . . . including Knickerbocker Village, 10 Gracie Square, and Blind Brook Lodge in the New York area.

SIX-POINT ADVISORY SERVICE

The Better Homes Department offers a *Six-Point Advisory Service* to the building profession, featuring advice on the following subjects:

1—Selection of correct types of electrical equipment for various classes of postwar homes.

2—Location and arrangement of fixed equipment, for conserving space and attaining maximum efficiency in arrangement of work cycles.

3—Accurate dimensions and clearances of equipment to insure proper installation and efficient operation.

4—Access for servicing of equipment—so necessary for periodic inspection and repair.

5—Location of lighting outlets and controls, for greater enjoyment, comfort, and safety in the home.

6—Utility service connections—including location and size of electric wiring, water supply, and drainage lines.

This Six-Point Advisory Service is available to contractors, builders, architects, engineers, public utilities, housing authorities, electrical inspectors, building management, and investment institutions.

Westinghouse Better Homes Department welcomes the opportunity of giving constructive assistance to those interested in postwar housing.

If you have any problems relating to the selection, installation, and use of home electrical equipment, write: Better Homes Department, Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.

A NEW APPROACH TO ELECTRICAL LIVING IN 194X

A carefully co-ordinated program . . . for assisting the building profession and homeowners in the attainment of *better wiring for better living* . . . will be announced soon.

Watch for it!

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

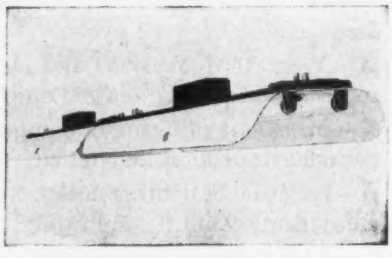
Starter

A new "No-Blink" starter, FS6-NA, for the 100-watt fluorescent lamps has been announced. It automatically locks out a deactivated lamp and automatically restores to normal operation when new lamp is installed. It has the glow switch which provides perfect starts on normal lamps. In addition it has a bi-metallic element which automatically opens the glow switch circuit after a few unsuccessful attempts to start a deactivated lamp. Prompt action of automatic lockout stops blinking. Ballasts are protected against overheating. Bryant Electric Co., Box D, Barnum Station, Bridgeport, 2, Conn.

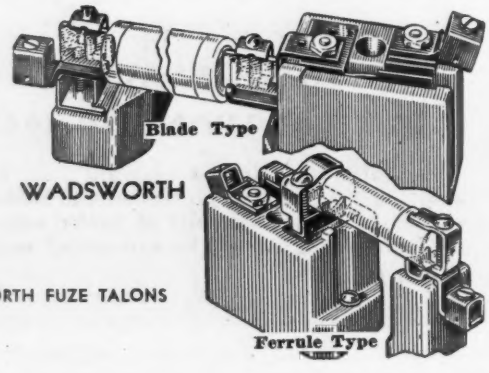
BRYANT STARTER

Fluorescent Luminaire

This new lightweight industrial fluorescent luminaire with one-piece, double-length hood and two full-size reflectors is designed for easy continuous strip installation. It is available for use with four or six 40-watt or four 100-watt Mazda F lamps. The hood is fabricated from sheet steel with all ballasts, lampholders and starter sockets mounted and wired as part of channel assembly. New sliding hangers permit suspension from any part of the hood. Mounting arrangements are available for any application. Wing-lock permits easy removal of reflectors for cleaning. Westinghouse Lighting Division, Westinghouse Electric and Manufacturing Company, Edgewater Park, Cleveland, Ohio.



WESTINGHOUSE FLUORESCENT UNIT



WADSWORTH FUZE TALONS

Fuze Talons

Type A and Type C switches are now available with pressure type fuse clamps, known as fuze talons. This new development, designed on the high pressure line con principle consists of: fuse seats, press formed of copper; grip clamps, press formed of heavy gauge plated steel. is claimed to hold fuses tight, maintain constant high pr sure, provide a secure positive electrical contact between and fuse seats, lower operating temperature. They approved by Underwriters Laboratories, Inc. The Wa worth Electric Mfg. Co., Inc., Covington, Ky.

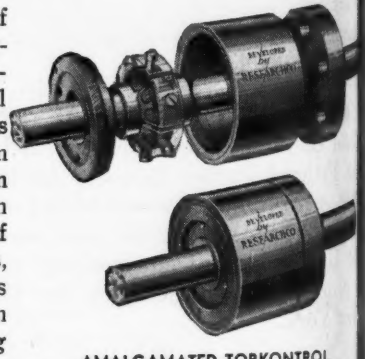
Transformers

A new design of G-E's line of indoor dry-type transformers for primary circuits 601 to 15000 volts provides greater safety and ease of installation. The new case provides improved and directed circulation of the cooling air. It is functional, being designed especially for indoor installations in industrial plants. Horizontally louvered sections on two sides of the case can be removed, making the interior accessible for cleaning and tap changing. All live parts metal enclosed. High-voltage terminal compartment co can be removed to facilitate connecting the transformer the supply circuit. Access to the low-voltage terminals gained by removing the low-voltage compartment co General Electric Company, Schenectady, N. Y.

G-E TRANSFORMER

Centrifugal Clutch

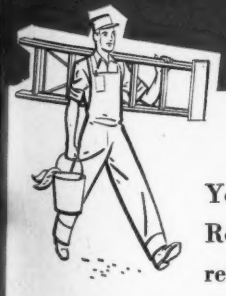
A new type of automatically engaging and self-disengaging centrifugal clutch, known as Torkontrol, has been announced. It can be produced in an unlimited range of sizes and capacities, can serve either as a coupling between shafts or as a driving pulley or gear in a transmission, as well as a starting cushion between power units and dri mechanisms. Unit consists of a partially filled oil cham fitted with a freely rotating hub, which carries a series movable wedge shaped flyweights. As the hub revolv these weights fly outwardly and engage the internal ri of the outer case binding the hub and shell into a functi ally solid pulley or coupling. The unit is reversible, wo ing in either direction. Clutches have been built in all si from ¼ hp. to 500 hp. for both built-in and general appli tion. The Amalgamated Engineering & Research Corpo tion, 100 West Monroe Street, Chicago 3, Ill.



AMALGAMATED TORKONTROL

ALZAK* ALUMINUM REFLECTORS

take a long time to "grow old"



Year after year, Alzak Aluminum Reflectors retain their youthful reflectivity to a degree which invites comparison. Their Alumilite finish (process patented) is smooth and glass-like hard; easy to keep clean. There's no chipping because this oxide coating is an integral part of the metal.

The engineer who designed your lighting system chose Alzak Aluminum Reflectors because it placed no limitations on the shapes of the reflectors. It also gave him high efficiency, enabling him to direct the kind of light you wanted exactly where you wanted it. More and better production resulted.

To be certain you are maintaining that efficiency, establish regular cleaning schedules. Dust the reflectors, or wash them with mild soap and water. Or, where conditions are more severe, use methods which will remove the deposited dirt and grime. The book, "Instructions for the Protection and Maintenance of Alumilite Finishes and Alzak Reflectors," tells you what to do.

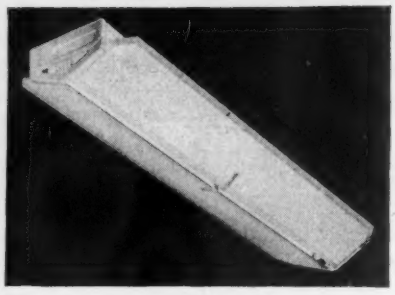
For a copy, write ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh, Pa.

*Registered Trade Mark

ALCOA ALUMINUM

Fluorescent Fixture

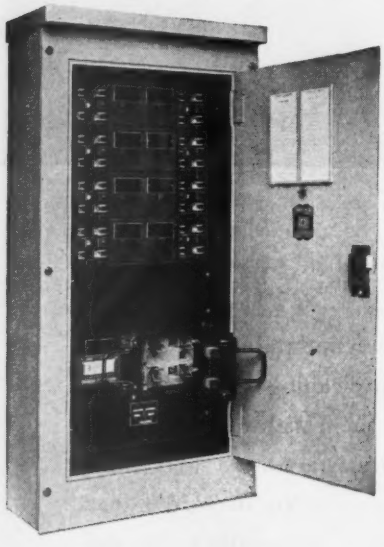
A new fluorescent lighting fixture is now available for use in offices, drafting rooms and other commercial areas. It is known as the Aristolite and is available in sizes for two, three and four 40-watt lamps. It provides full diffusion of light rays to reduce reflected glare. The glass panels are easily removed for servicing and relamping. It has a steel housing that totally encloses all accessories and wiring. Its end-design permits flush-abutment of units when continuous installations are desired. Unit can be suspended or mounted close to the ceiling. The Edwin F. Guth Company, 2615 Washington Ave., St. Louis, Mo.



GUTH ARISTOLITE

Panelboards

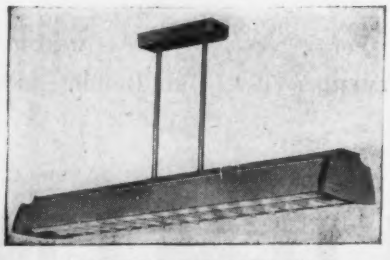
Combination power and lighting panels for marine use are now available. The panels are made to meet either low or high shock specifications of the U. S. Navy. The panel illustrated was built to meet low shock requirements and has eight 2-pole 30 ampere lighting circuits and two 2-pole 60 ampere power circuits. The box is dripproof. Square D Company, 6060 Rivard Street, Detroit 11, Mich.



SQUARE D PANELBOARD

Fluorescent Unit

A new series of commercial fluorescent lighting units for office and drafting rooms has been announced. The Grenadier, illustrated, is available either for ceilin or suspension mounting and is equipped with etched ribbed glass, to reduce brightness of the lamps. Wooden louvers are provided to permit downward light and shield the lamps to prevent glare. The unit has an improved mounting device. It uses two 40-watt fluorescent lamps. Other units in this series are the Captain for general illumination where seeing requirements are not severe; the Beacon, a glass paneled unit in which brightness of the lamp is reduced by frosted rib glass and the Admiral, a lighting unit made largely of wood. All units meet weight limitations as to steel content, specified by WPB. The F. W. Wakefield Brass Co., Vermilion, Ohio.



WAKEFIELD GRENADIER UNIT

Searchlight

A new high-intensity air-conditioned mercury searchlight has been announced. It is available in 12-, 18- and 24-inch diameters and comes in a wide variety of mountings suitable for shipboard or land use. Light source is a midget capillary-type 900-watt mercury lamp. The lamp is air-cooled for operation in all types of weather. When the searchlight is on, air is forced constantly through a rubber hose into the top of the searchlight drum by an air compressor. The searchlight is weatherproof. The rear door which also acts as a support for the silvered glass reflector gives access to the interior for relamping. The searchlight is directed through the use of a handle on the rear door. Mountings are of the pilot house control, low base, stanchion or high pedestal type. General Electric Company, Schenectady, N. Y.

G-E SEARCHLIGHT

Sound Distributor

A new type of annular sound distributor, Type L-360, has been announced. This distributor utilizes a different principle of sound distribution in that it combines molecular reflection and collision instead of collision alone. It results in a uniformity of sound distribution both as to frequency and power over a horizontal plane of 360 degrees and a vertical plane of approximately 40 degrees. The distributor is 23-in. in diameter with an overall height of 25-in. It will handle power input of 20 watts when equipped with Jensen U-20 drive unit. The Langevin Company, 37 West 65th Street, New York 23, N. Y.

LANGEVIN SPEAKER UNIT

MASTER

COMBINED OPERATIONS

This war has proved to our military staff that there is one best way to do a sure-fire job . . . "combined operations" of picked units from the army, navy, marine and air corps operating as a hard hitting, integral task force.

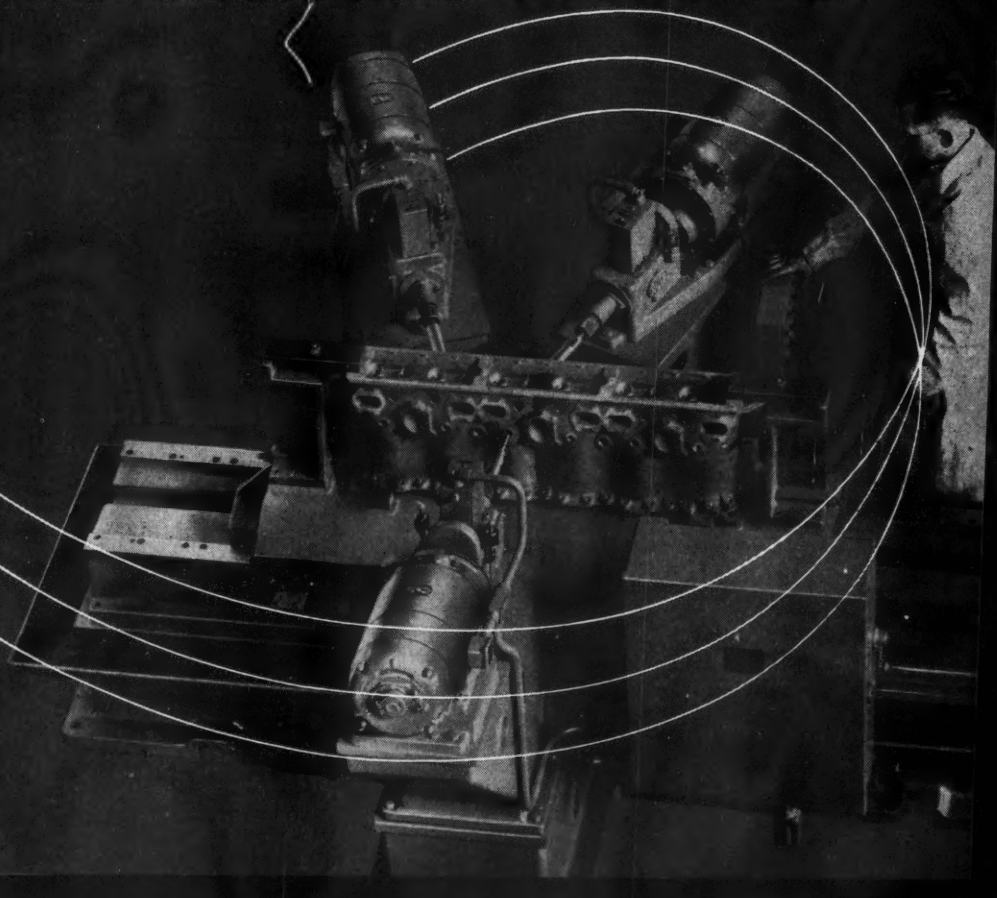
And you will find that the wide flexibility of the Master line of electric motor drives makes it possible for you to use the same tactics.

For example, the power drives on the machine below combine a motor, a gear reduction and an electric brake . . . all in one compact, integral, task force unit. These drives could also include the Master Speedranger for variable speed operation and can be supplied in enclosed, splash proof, fan-cooled or explosion-proof construction and with their construction so modified that the mounting possibilities are practically unlimited.

This wide flexibility in a compact integral construction saves space . . . saves a large part of your assembly and mounting costs . . . eliminates many unneeded parts . . . saves you a lot of time and money.

When you need motors for your plant or your product, investigate Master's unusual ability to help you improve the economy, compactness and appearance of your motor driven equipment with task force power units.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO



[FROM PAGE 89]

finishing lead of the coil and the starting lead would have to be on the armature side.

It is apparent that the field coils can be wound either start-on-right or start-on-left and arranged so that either the starting or finishing lead can be used for the D or in lead of Fig. 2 (a) and (b). However, as it is desirable to use one standard method as much as possible, the most handy method can be selected. Details of this will be provided in later articles.

The preferred standard coil winding method for coils made from round, square or ribbon wire, and built up by turns and layers, is to start on right. Then for north pole magnetic polarity the coil would have to be arranged for counter-clockwise winding, and the starting lead on the armature side to be the D lead of Fig. 2 (a) and (b).

The next alternate would be a start-on-right coil, arranged for clockwise winding and the starting lead on the frame side. The finishing lead of the coil would then be the D lead of Fig. 2 (a) and (b).

The standard basic main coil can be termed as north polarity, starting-on-right, starting lead on armature side, arranged for counter-clockwise winding, and lead D or "in" lead, the starting lead of the coil. By comparing this data for the D lead of a north polarity coil, with that in the first article for a south pole, we again find the major items reversed.

Clockwise armature rotation is considered standard, but the tables and figures in this article can be used to check the various factors that vary with the direction of armature rotation in a motor or generator.

The arrows and letters of Figs. 1 and 3 indicate the proper magnetic polarity for commutating poles, when the basic main pole is of north polarity. When using Figs. 1 or 3, it should be kept in mind that the arrows indicate armature rotation.

The basic north main pole on the vertical center line is shown in Fig. 1. Then for clockwise armature rotation in a motor, Table 1 tells us that commutating pole A must be of north polarity. Likewise for a generator and clockwise armature rotation, Fig. 1 Table 1 shows that commutating pole A must be of south polarity.

When the basic north main pole is to the left of the vertical center line, in the lower half of the frame, Fig. 3, shows the proper polarity for the commutating pole A for motors and generators, and for either armature rotation.

Then for clockwise rotation in a motor, Fig. 3 Table 1 shows that the commutating pole A, should be of south polarity. For a generator and clockwise armature rotation, Fig. 3 Table 1 shows that the commutating pole A should be of north polarity.

Thus, moving the location of the basic north main pole also changes the magnetic polarity of the commutating pole A. This is caused by retaining the magnetic polarity of the main pole, while changing the location of the commutating from the left to the right of the main pole.

As discussed in the preceding articles, the brush polarity can be selected by adopting the brush on the center line of a main pole having the same magnetic polarity as the basic main pole. In this case the north main pole is the starting point.

With a negative brush on the center line of a north main pole, as in Fig. 1 and 3, the armature rotation would be clockwise for lap or wave retrogressive windings, in either a motor or generator.

For a progressive wave winding and negative brush polarity, the armature rotation would be counter-clockwise.

Tables I and II with Figs. 1, 2 and 3 show how the various factors must be varied to obtain any desired result, when using a basic north main pole. The data in the preceding articles can be used in conjunction with this material.

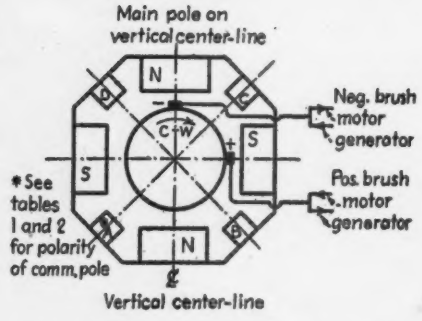


FIGURE 1—Standard brush polarity for CLOCKWISE *armature rotation in a motor or generator, lap or* RETROGRESSIVE *wave windings.*

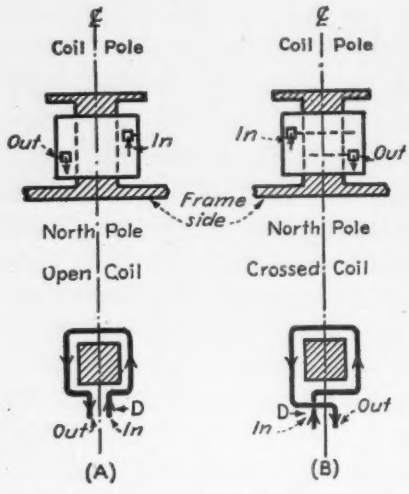


FIGURE 2—Direction of current flow in standard index north polarity coil.

TABLE I

Polarity of brushes and commutating poles for clockwise armature rotation of motors and generators (basic main pole of north polarity)

App.	Type of Winding	Polarity of Brush on Center line of North Pole	Polarity of Commutating Pole A: Comm-Pole on Vertical Center, line Fig. 3	Polarity of Commutating Pole A: Main Pole on Vertical Center line Fig. 1
Motor	Lap Progressive	Negative	South	North
	Wave Retrogressive	Negative	South	North
	Wave Progressive	Positive	South	North
Generator	Lap Progressive	Negative	North	South
	Wave Retrogressive	Negative	North	South
	Wave Progressive	Positive	North	South

Polarity of D-C Field Coils

TABLE II

Polarity of brushes and commutating poles for counter-clockwise armature rotation of motors and generators (basic main pole of north polarity)

App.	Type of Winding	Polarity of Brush on Center line of North Pole	Polarity of Commutating Pole A: Comm-Pole on Vertical Center line Fig. 3	Polarity of Commutating Pole A: Main Pole on Vertical Center line Fig. 1
Motor	Lap Progressive	Positive	North	South
	Wave Retrogressive	Positive	North	South
	Wave Progressive	Negative	North	South
Generator	Lap Progressive	Positive	South	North
	Wave Retrogressive	Positive	South	North
	Wave Progressive	Negative	South	North

Polarity of D-C Field Coils

FIGURE 3—Standard brush polarity for CLOCKWISE *armature rotation on a motor or generator, lap or* RETROGRESSIVE *wave windings.*

Some interesting facts can be obtained by comparing the tables and sketches in this article for north basic main pole, with the tables and sketches in the first two articles for a south basic main pole.

Thus the two major differences between the two basic main pole methods are the reversed polarity for the brushes in the same mechanical location, and the reversed current flow in the basic main pole coils.

The next article will show a typical method of making a field coil winding diagram and other coil details.

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION

Wesco effected pilot control of motors

Radical Use of Motor Starters Ended Sub-Chaser Space Problem; Saved 67% of Cost.

Installed in the sub-chaser were two ¾ h.p. direct current motors. The plan called for control of the motors from the pilot house but the space was too cramped to contain the standard direct current starters, each of which was 12" wide, 11⅜" deep and 14" high. Wesco engineers suggested a radical idea—the use of a type of linestarter employed in industrial plants. This starter is 4⅝" wide, 3⅞" deep and 7¼" high, and occupies only 1-15th the cubic bulk of the conventional starter.

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The ability to find practical and efficient solutions to seemingly impossible problems, has featured Wesco's speed-the-Victory service to war plants, the Army and the Navy. That ability will be at your command in 194X.

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* 190 separate electrical items, involving 45 manufacturers, were required for two 110-foot sub-chasers. Wesco ordered, assembled, and delivered each set of 190 units at a great saving in time and labor.
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1 Bulletin GEA-3706 consisting of 36 pages, illustrates and describes ignitron mercury-arc rectifiers for 501-kw and higher ratings, 250 to 900 volts. General Electric Co.

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2 A 16 page folder describing and illustrating squirrel cage induction polyphase motors. It tells how to select the one best suited for the application. Century Electric Company

FLUORESCENT FIXTURES

3 Bulletin F-70 features this new series of four-lamp fluorescent lighting fixtures for use in work areas in war plants and government buildings. Day-Brite Lighting, Inc.

TOOLS

4 This wartime maintenance manual is designed as a handy guide to greater production and longer tool life. It gives suggestions on the care and operation of portable electric tools. Skilsaw, Inc.

VARNISH

5 A folder telling about a new electrical insulating varnish, for use on high speed armatures and tightly wound fine wire coils. It is known as "Synthite PG-4 Clear Baking Varnish." John C. Dolph Company

ELECTRICAL PARTS

6 Bulletin L3 illustrating and describing electrical parts such as bus straps, wire terminals, lugs as specified by U. S. Navy and Army Air Forces, and contract stampings. Kolton Electric Mfg. Co.

TRANSFORMERS

7 Bulletin GEA-3714B features dry-type distribution transformers above 600 volts. Standard dry-type transformers in smaller ratings are also listed. General Electric Co.

SYNTHETIC RUBBER

8 A booklet entitled "Facts About Synthetic Rubber". It describes Buna S, Buna N, Neoprene, Butyl, and Thiokols. New York Belting & Packing Company

POSTWAR BUILDINGS

9 A new booklet showing what [illegible] expect in every type of build[illegible] —commercial, public, industrial [illegible] residential. Robertson Q-sections [illegible] used for floors, walls, partitions [illegible] roofs. H. H. Robertson Co.

COMMUNICATION SYSTEMS

10 A folder illustrating and descri[illegible] ing two-way private or amplifi[illegible] communication systems for office, [illegible] tory, institutional and military [illegible] Executone, Inc.

TRANSFORMERS

11 A map showing how to get mo[illegible] load out of a transformer duri[illegible] the winter months. Pennsylvania Tra[illegible] former Company

EMERGENCY LIGHTING

12 Bulletin No. 144 describes a[illegible] illustrates master lights for dis[illegible] ter, flood, riot, fire and everyday u[illegible] both indoor and outdoor. Carpe[illegible] Manufacturing Company

GENERATORS AND EXCITERS

13 Bulletin GEA-1607D featur[illegible] direct-current generators and e[illegible] citers designed for use in a wide ra[illegible] of industrial and general applicatio[illegible] where continuous use is required. G[illegible] eral Electric Co.

DRIVES

14 This new 70-page handbook [illegible] plains the automatic belt ten[illegible] control feature of American Econ-o-ma[illegible] drives. The American Pulley Compa[illegible]

TOOLS

15 Catalog No. 44, consists of [illegible] pages of illustrations and descri[illegible] tions of this complete line of pipe [illegible] and machines. Beaver Pipe Tools, [illegible]

ELECTRICAL EQUIPMENT

16 Bulletin GEA-3710 illustrates [illegible] describes equipment used in [illegible]

[Continued on page 106]

Circle numbers, sign and paste on your letterhead and mail in an envelope.

ELECTRICAL CONTRACTING **January**
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Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

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31	32	33	34	35	36	37	38	39	40	41	42			

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New Literature

[FROM PAGE 104]

chemical industry for generating, transforming, and distributing power; for material handling; for processing in the electro-chemical and thermo-chemical fields; and for operation in dusty atmospheres and in hazardous locations. General Electric Co.

SAWS

17 Catalog No. 43-S contains technical data on metal-sawing operations, together with practical suggestions for merchandising of the complete line of Star hack saw blades, frames, power saws and hand saws. Clemson Bros., Inc.

COLD CATHODE LIGHTING

18 Bulletin 162 describes cold cathode lighting and discusses the utility, adaptability, color harmonics, safety, efficiency and future possibilities of continuous tube light source. Acme Electric & Mfg. Co.

FUSE PULLER AND CONNECTORS

19 Two new folders, one describing the "Safe-T-Grip" fuse puller and the other one featuring wire connectors. Ideal Commutator Dresser Co.

SIGNAL DEVICES

20 Bulletin No. 480, consisting of 24 pages, describes and illustrates a large number of newly designed devices for marine uses. Edwards and Company

INSULATING MATERIAL

21 An 11-page publication, No. 177-37, describes properties, advantages and applications of mycalex. General Electric Company

MOTOR

22 Bulletin No. 1160 features the new protected polyphase squirrel-cage induction motor. Illustrations, construction details and motor characteristics are given. Fairbanks, Morse & Co.

CABLE

23 Bulletin No. GEA-4115 outlines merchant marine shipboard cable. It covers lighting and power cable, bell wire, interior communication cable, telephone cable, inter-cabin telephone cable and propulsion cable. General Electric Co.

VACUUM SWITCHES

24 Publication ET-1-A covers four new vacuum switches for a wide variety of radio and industrial switching applications. They can also be adapted to oil or water immersed operation because of enclosed construction and are applicable for hazardous installations where fire and explosion are a constant risk. General Electric Co.

[Continued on page 108]

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Uni-Pact Signals

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The Dead-Front Adapter-Plate is a part of each UNI-PACT signal assembly. It is identical for all sizes and fits each one without change of electrical connections.

***UNI-PACT* SAVES TIME, MAINTENANCE AND INSTALLATION COSTS**

SCHWARZE ELECTRIC COMPANY

ADRIAN, MICHIGAN

New Literature

[FROM PAGE 10

INCHER

25 Publication No. 170 illustrates and describes the E-M Incher, an easy-to-use method of spotting or slowly rotating a 3-phase synchronous motor or slip-ring induction motor. Electric Machinery Mfg. Co.

FLUORESCENT LIGHTING

26 A 4-page folder featuring Model MF-240-N for instantaneous fluorescent starting. Illustrations and methods of mounting are shown. The Fostoria Pressed Steel Corp.

AIR CONDITIONING

27 Booklet 3AC-0201, consisting of 20 pages, illustrates and describes air conditioning and industrial refrigeration. Westinghouse Electric and Manufacturing Company

WELDING AND CUTTING

28 A 16-page, pocket-size booklet entitled "Preventing Welding and Cutting Fires", instructs users of welding and cutting equipment in reducing potential fire losses. International Acetylene Association

CONTROL SWITCH

29 Folder GEA-4114 outlines master control switch, Type SB-9, for heavy-duty service. It is used where repetitive operations of electrically operated devices run into many thousands a week. General Electric Co.

ELECTRICAL CONNECTORS

30 A 4-page folder featuring the Cannon visual wall charts, which were prepared for the use of aviation schools, aircraft plants, repair shops, etc. for the instruction, assembly, ordering, servicing or repair of Type AN connectors and ready reference for engineering department. Cannon Electric Development Company

COMMUTATOR CLEANER

31 A folder illustrating and describing an industrial commutator cleaner, a safety tool for electricians, machinists and motor inspectors. Industrial Power and Equipment Co.

INSTRUMENTS

32 Booklet GEA-4064 features internal-pivot 2½-inch diameter panel-type electric indicating instruments. General Electric Co.

WRENCHES

33 Catalog No. 243 is a wartime buyer's reference on socket, box type and open-end wrenches, torque indicators and wrench assortments. Blackhawk Mfg. Co.

[Continued on page 110]

"Give us SLEEVING that's RUGGED..."

Operator at the Muskegon plant of Anaconda Wire & Cable Co. slipping Natvar sleeving on coil leads.

THAT was Anaconda Wire & Cable Company's first requirement for the sleeving to be used on coils they are building for certain vital war equipment.

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"And another thing — most of them are needed *yesterday*, so we're shipping 'em out each day as soon as they pass final tests. We run into trouble if the sleeving isn't smooth on the inside — it slows us down because most of our leads are dead soft or stranded. It may sound like a little thing — but it's important.

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New Literature

[FROM PAGE 10

FLUORESCENT FIXTURES

34 Bulletin No. 43-C illustrates t new "5000 line" of fluoresce luminaires with non-metallic reflecto and light-weight, streamlined channel plus the "Insta-Start" fluorescent contro Martin-Gibson Co.

INSTRUMENTS

35 A bulletin illustrating and descri ing Model 330F frequency mete for 400 cycles. J-B-T Instruments, In

ELECTRICAL DEVICES

36 A 16-page booklet outlining thi line of sockets, switches, termi nals, lugs, lamp holder, junction box accessories and specialties. Kulka Elec tric Mfg. Co., Inc.

SAWS

37 Catalog No. 43-V is a combina tion technical instruction book and sales manual on the entire line o Victor standard steel hack saw blades Victor Saw Works, Inc.

CONNECTORS

38 A 10-page Supplement of latest information on Type AN elec trical connectors. It contains layouts o new insert arrangements, tabular matte and special plugs. Pages are in loose leaf form to be used in current genera catalog. Cannon Electric Developmen Company

FLUORESCENT LIGHTING

39 A 4-page folder illustrating an describing U.R.C. Research lumi naire. Installation and lighting data are given. Mitchell Mfg. Co.

DELIVERY TRUCK DATA

40 A booklet entitled "Wartime In formation for the Delivery Truck Operator." It covers the text of OD 17 and gives suggestions regarding truck conservation and maintenance. The Studebaker Corporation

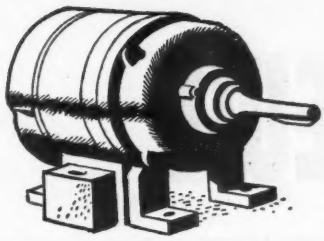
SLIDE RULES

41 Data on three new slide-rules— one for the professional draftsman, one for the apprentice draftsman or student and a five inch pocket slide rule. Frederick Post Company

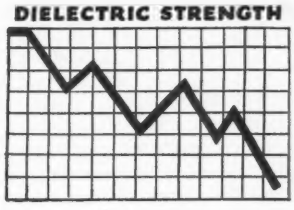
ELECTRICAL EQUIPMENT

42 Bulletin 3100, consisting of 2 pages, describes, illustrates, and lists all Square D electrical equipment meeting Marine and Naval requirements for use in yards and docks, plus typical shipboard layouts. Square D Company

1. ***Moisture can play hob around electrical equipment.***



2. ***It can be absorbed into the insulation and lower its dielectric strength.***



3. ***It can eventually result in all sorts of maintenance misery, as every engineer too well knows.***

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ELECTRICAL INSULATION

IN THE NEWS

NEW CMP REGULATION NO. 9A ISSUED

Procedures under which persons engaged in the business of making repairs may obtain controlled materials and other materials and parts have been established in a new CMP Regulation No. 9A by the Office of Civilian Requirements.

An amendment to CMP Regulation No. 9 governing retailers' acquisitions of copper wire, was also announced. The new CMP Regulation No. 9A permits persons operating farm machinery repair shops, blacksmith shops, radio repair shops, upholstery repair shops and electricians, plumbers, and others engaged in any type of repair work, to buy up to 20 tons of carbon and alloy steel, a total of 500 pounds of copper and copper base alloy brass mill and foundry products, and 200 pounds of aluminum in specified forms and shapes in any calendar quarter.

Special provision is made in the regulation to permit refrigeration repairmen, electricians, domestic appliance repairmen, electrical contractors, and radio repairmen to buy $150 worth of copper wire or one-eighth of what they used during 1941 (figured as accurately as possible by dollar volume), whichever is more.

The regulation permits repairmen to buy as much other material as they need for maintenance and repair work.

The amendment to CMP Regulation No. 9, eliminates from that regulation provisions under which repairmen were formerly able to obtain copper wire, inasmuch as repairmen will now obtain wire under CMP Regulation No. 9A.

To buy materials and parts under CMP Regulation No. 9A, a repairman must put a certification in substantially the following form on his orders:

CMP Allotment Symbol V-3: Preference Rating AA-3 "The undersigned purchaser certifies, subject to the penalties of Section 35 (A) of the United States Criminal Code, to the seller and to the War Production Board, that, to the best of his knowledge and belief, the undersigned is authorized under applicable War Production Board regulations or orders to place this delivery order, to receive the items ordered for the purpose for which ordered, and to use any preference rating or allotment number or symbol which the undersigned has placed in this order."

Repairmen who do work for persons who have the right to use an AA-2X or higher preference rating to buy non-controlled materials and parts for their own maintenance and repair, may use their customers' ratings to buy what they need for repair or maintenance work or to replace inventory used for such purposes.

Special provisions are made in Regulation No. 9A for repairmen whose work is primarily of an industrial nature. WPB may authorize such repairmen to buy up to 2,000 pounds of copper wire and a total of 2,000 pounds of copper and copper base alloy brass mill and foundry products. They may also be authorized by WPB to use an AA-2 preference rating. Applications for such authority should be addressed by repairmen engaged principally in industrial repairs to War Production Board, Reference CMP Regulation 9A, Washington (25), D. C. Application must be by letter and must (1) show what kind of work the repairman is doing and (2) what kind of customers he has.

If a repairman, industrial or other, requires more controlled materials in a quarter than he may get under Regulation No. 9A, he should fill out and send to WPB in Washington, a Form CMP 4B. WPB may then allot additional controlled materials and assign him a preference rating. However, if a repairman gets an allotment he may not use the provisions of CMP Regulation No. 9A to purchase controlled materials, non-controlled materials or parts.

The regulation specifically prohibits repairmen from fabricating repair parts they intend to sell to others, rather than themselves, with the materials that they obtain under the procedures it establishes.

Deliveries of materials may not be accepted if the inventory of the repairman accepting such deliveries would become in excess of a 60-day supply, except in the case of copper wire, with respect to which the inventory limitation is 15 days.

Attention is called to the fact that materials obtained under CMP regulations may not be used in violation of other regulations and orders of WPB, and that in any case where special application is required to obtain certain materials such application must be filed in order to obtain them.

Despite the fact that the new regulation makes provisions for repairmen to obtain copper wire, the War Production Board

"Now the sink should be over there, the stove opposite it. If I was ironing I'd do it about here so we'll put a floor plug right where you are sitting."


CENTRAL
RIGID STEEL
CONDUIT
CENLACO (HOT DIPPED)
CENTRAL BLACK
"There's Tested Strength
in Every Length"
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1894 to 1944 is a long span of years . . . a span that has seen this organization develop to its present size through constantly keeping user interest foremost. In the beginning, our objective was to design and provide the finest, most complete line of Electrical Wiring Products that sound engineering and modern facilities could produce. Today—50 years later—the great demand for our products and our exceptional growth testify to the accomplishment of that objective. 1944 will be the start of our second half century and we pledge a continuance of AUSTIN Quality and Service.

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Chicago 6, Ill.	C. B. Underwood	108–116 So. Desplaines St.	HAYmarket 4070
	R. E. Van Natta	108–116 So. Desplaines St.	HAYmarket 4070
	Z. Diamond	108–116 So. Desplaines St.	HAYmarket 4070
	Russell Jessee	108–116 So. Desplaines St.	HAYmarket 4070
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Detroit 2, Mich.	R. J. Thorne	7720 Woodward Ave.	TRinity 2-7618
Ft. Lauderdale, Fla.	P. J. Webb	715 S. E. 1st. St.	. . . . .
Kansas City 4, Mo.	Hawkins Electric Sales Co.	5518 Michigan Avenue	JAckson 0392
Los Angeles 13, Cal.	J. G. Pomeroy Company	1004 East Fourth St.	MAdison 1105
Montreal, Canada	The M. B. Austin Co. of Canada	611 St. James St., West	LAncaster 9750
New Orleans 13, La.	Southern Sellers	918 Union Street	MAgnolia 3434
New York 7, N. Y.	Corey Company, Inc.	81 Murray Street	BArclay 7-2494
Omaha 2, Nebraska	Midwest Equipment Co.	213 South 12th St.	HArney 5244
Philadelphia 7, Pa.	W. A. Leiser & Co.	1219 Race Street	RITtenhouse 5477
Pittsburgh 5, Pa.	G. E. Wehner	1739 Stratmore Avenue	WALnut 0377
San Francisco 3, Cal.	F. M. Nicholas Co.	1123 Harrison Street	UNderhill 4830
Seattle 4, Wash.	W. W. Wheat & Son	560 1st Ave., South	ELliot 6554
St. Louis 3, Mo.	Hawkins Electric Sales Co.	1706 Olive Street	CHesnut 4821

THE M. B. AUSTIN COMPANY

108-116 So. DESPLAINES ST. CHICAGO 6, ILL.

lls their attention to the fact that certain pes of wire will not be immediately avail-le, inasmuch as military requirements for em still absorb the major portion of the pply. However, certain types will be im-diately available and the procedure to tain such types is now outlined in the new gulation.

Changes in CMP Regulation No. 9, in-de the following:

1. Elimination of provisions permitting repairmen to obtain copper wire, since they now operate under CMP Regulation No. 9A.
2. Reduction of amount of copper wire which retailers may obtain to $50 worth per quarter or one-sixteenth of the amount sold during 1941.
3. Provision that retailers may fill farmers' order for copper wire upon receipt of a copper wire allotment certificate.

PECIAL REGULATIONS FOR EPAIR SERVICES AND CHARGES

Two new Supplementary Service Regu-ions have been issued to MPR No. 165. Regulation No. 21 covers two methods at may be used by service shops in the rious repair trades in setting charges customers to offset increased costs re-lting from the payment of overtime ge rates.

They apply to all suppliers of services ose prices are based on an hourly charge customers for labor under the terms of e Services Regulation (No. 165).

A choice of two pricing methods is now owed to shops with mechanics working hours a week who are paid at overtime tes for the last eight hours.

First, an additional charge is permitted work done in overtime hours, which y bear the same ratio to the regular urly charge that the overtime wage rate ars to the regular wage rate, providing e customer requests this overtime service d is willing to pay extra for it.

Under the second method, an upward justment of the regular customer's urly charge may be made in an amount at approximately represents the additional overtime cost. Where this method is used, all jobs are priced on the same basis during the full 48 hours of the work week, and each customer, by paying slightly higher prices, absorbs his share of the extra cost. The amounts that may be added are as follows:

Where overtime is paid for at 1½ times the regular rate, shops with customers' hourly charges under $1.75, may increase the hourly rate by 5¢. Those whose hourly charges range from $1.75 to $3.49 may increase the hourly rate by 10¢. Those whose hourly charges are $3.50 or more may increase the hourly rate by 15¢.

In exceptional cases, where the eight hours of overtime are paid for at double the regular rate, permissible increases are 10 cents on hourly charges below $1.75, 20 cents on charges from $1.75 to $3.49 and 30 cents on charges of $3.50 or more.

A shop must choose one or the other of the two methods for all work done within a 48-hour week, and cannot use both for that period. However, it may use the second method for 48 hours, and the first method for any additional overtime hours beyond 48.

Supplementary Regulation No. 22 covers the repair and maintenance services for mechanical, electrical and gas equipment and appliances used in the home, in hospitals, hotels, schools and business places. The Office of Price Administration has issued a special regulation that enables some suppliers to increase their prices.

The regulation enables suppliers who charge on the basis of a customer's hourly rate, to continue charging at their highest March, 1942 prices, if they choose, but offers alternate methods of determining ceiling prices.

A supplier of the services who employs mechanics may now choose one of four methods:

1—Charge the highest customer's hourly rate that the seller charged in March 1942.

2—Charge the customer for each hour of service a price that is double the average basic hourly wage rate paid on October 3, 1942, to employees performing the particular type of service.

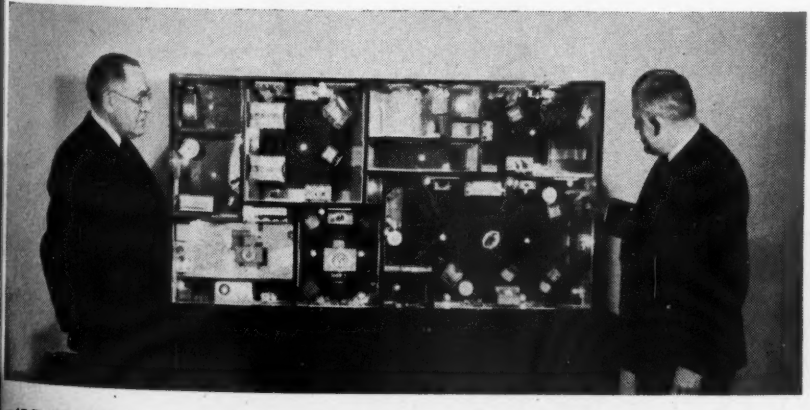
3—Charge the customer 60 cents more per hour of service than the average basic hourly wage rate paid on October 3, 1942 to employees performing the particular type of service.

4—If the supplier employs no more than eight employees, and is exempt from wage control by the National War Labor Board, add to the customer's hourly rate determined under either 2 or 3 above, an amount equal to the increase since October 3, 1942, in the average straight-time hourly rate for mechanics performing each type of service.

A person who does not have any employees may use either one of two methods to determine his charges, as follows:

He may charge the highest hourly rate that he charged in March, 1942, for the same service to a purchaser of the same class, or

He may charge the maximum hourly rate that is charged by his most closely competitive seller who does employ mechanics to perform the service.



ALL SET for postwar promotion of adequate wiring in the home, are Bob Nickels (left), president, Wisconsin Electrical Association; and E. M. Michelson, electrical inspector, City of Madison, Wis., who built the demonstration scale model of the home shown. The electrical system of the model, operating on a six-volt battery, illustrates proper spacing of outlets and, through resistance control of lamps, the advantages of increased illumination.

CHICAGO GROUPS ELECT '44 SLATE

At recent annual meetings of electrical contractor and motor service shop groups in Chicago, the following officers were chosen to guide the organizations through the coming year. The new officers officially took over their duties at respective installation meetings in January.

Cook County Electrical Contractors Association—president, T. L. Hankins, Condo Electric Co.; vice-president, Emil DeHaan, Service Electric Shop; secretary, George W. Reinke, Geo. W. Reinke Electric Co.; treasurer, Joseph Kunst, Principle Electric Company. Members chosen to serve on the Board of Directors included: incumbent Frank Block, Block Electric Co.; E. Ewald, Ewald Electric Construction Co.; Stanley Makuh, Stanley Electric Co.; J. M. Naal, Naal Electric Co.; A. C. Rosenberg, Summit Electric Co.; Joseph Turek (incumbent), Avers Electric Co.; Howard Zingraf, Square Z Electric Company.

Electric Motor and Service Association, Central District Chapter, NISA—incumbents chosen as officers were: president, B. R. Hohman, Hohman & Hill, Inc.; vice-president, Arthur Wagner, Sr., Arthur Wagner Co.; secretary, Charles Dahl, Dahl Electric Co.; treasurer, James J. Smat, Queen City Electric Company. New members of the Executive Board are W. J. Turner, Gregory Electric Co.; and Garrett Lea, Lea Electrical Equipment Co., who was elected to serve for the unexpired term of E. P. James. Present Board members serving unexpired terms are Charles Kaska, C. A. Sievert and E. J. Ther.

Herbert Binner, executive secretary of both associations, continues in that office.

MILWAUKEE GROUPS STUDY ELECTRONICS

Electrical groups in Milwaukee, Wis., have organized study programs to promote a better understanding of the functions and applications of the electronic tube in the industrial and commercial fields.

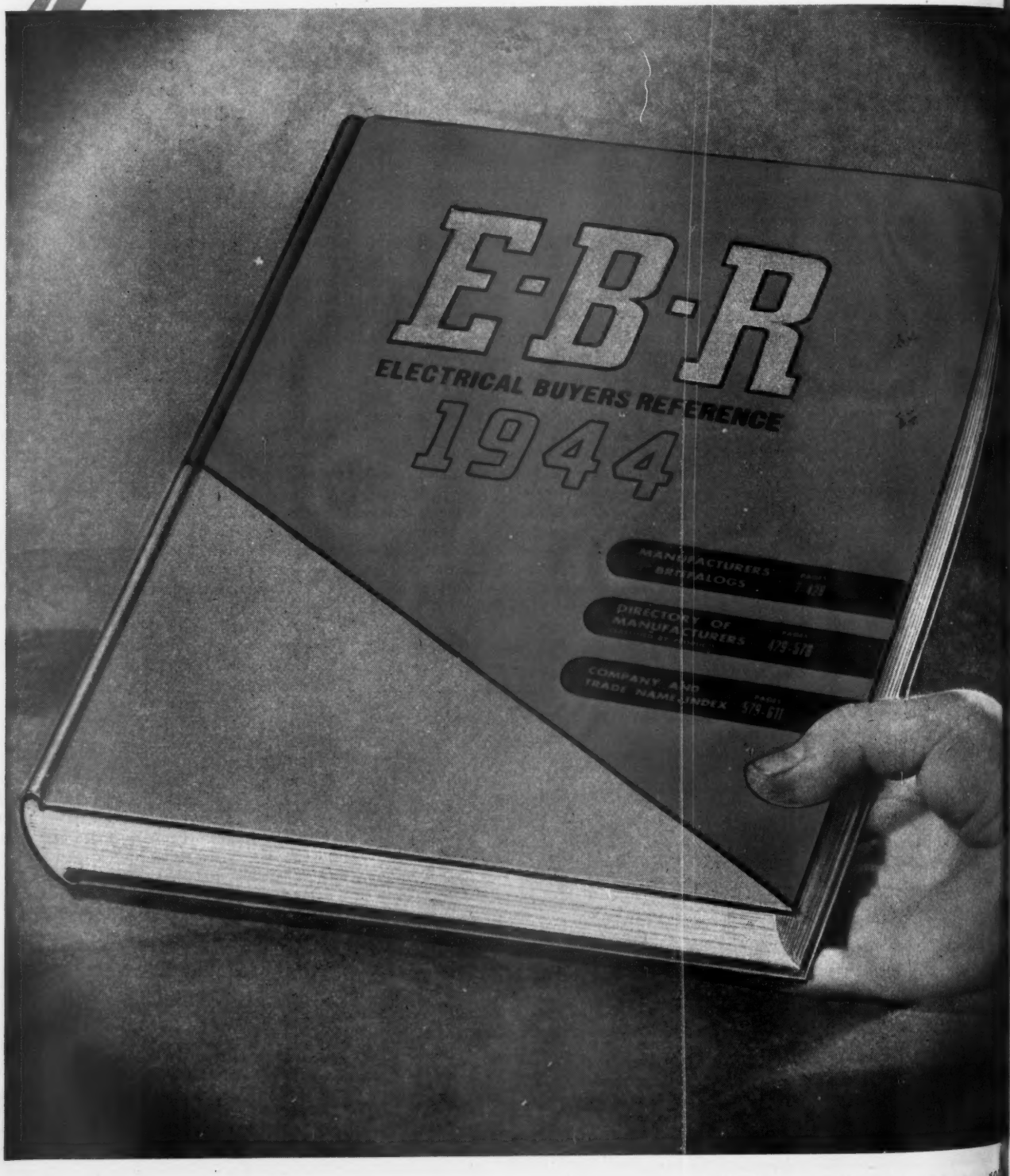
The Electrical Contractors Association, Milwaukee Chapter, NECA, through its

A 612 PAGE BOOK

Just published!

416 *BRIEFALOG

Due to wartime printing restrictions, the color of this book reproduced here is not strictly "on the beam" . . . It should be bright orange, blu



PAGES from 307 MANUFACTURERS

The 1944 E-B-R Contains

MANUFACTURERS BRIEFALOG SECTION — The condensed catalogs of 307 manufacturers of electrical and allied products. In addition to vital information for planning, specifying and requisitioning, you will find listings of branch offices, warehouses, etc.

CLASSIFIED DIRECTORY OF MANUFACTURERS — Here for quick reference you will find company addresses and trade names, arranged by product. Extensive cross-references to help you find the electrical and allied products made by more than 3,500 manufacturers. Bold face listings are used throughout to indicate the pages where each manufacturer's product data is given.

ALPHABETICAL INDEX OF TRADE & COMPANY NAMES — Complete with addresses. Starting with only a trade name or a company name, you can thus quickly locate the product data you need.

NOTE: Distribution of E-B-R has no connection or relationship with subscriptions to any McGraw-Hill publication. Every year E-B-R is sent to approximately 30,000 large electrical contractors, electrical wholesalers, large industrial plants electric utilities, electrified railroads, mines, government services.

HERE'S WHY!

People who write in for copies of E-B-R are frequently surprised to learn that the distribution of the book has already been completed. "Why advertise it, then?", they sometimes say.

Here's why: Once we send out the book we want to be sure that the recipients are aware of the usefulness of the product data they have, and that they use it frequently. So we tell them our story regularly, through advertisements such as this one.

Electrical Buyers Reference
McGraw-Hill Publishing Co., Inc.
330 West 42nd Street, New York 18, N.Y.

★ Briefalogs are the modern method of cataloging, with condensed descriptions and specifications on products, plus branch offices, distributor and warehouse addresses for quick follow through.

The latest up-to-the-minute data at your fingertips!

Things are happening so fast these days. . . product changes, new materials, etc. . . . even the most complete catalog file can be out of date.

Right now, when you're busiest, this new 1944 Electrical Buyers Reference can be *so useful!* Larger and with more product data than ever before in its history, it gives you a wealth of information that you need every day . . . all substantially and attractively bound in one volume.

You'll be surprised when you discover how much time you can save by referring *first* to the compact, comprehensive 1944 E-B-R. There just isn't *anywhere* else that you can get the latest product data of over *three hundred* manufacturers of electrical and allied products so quickly.

Put E-B-R to work the moment it lands on your desk. Keep it within arm's reach through '44. It will save you time and money!

Labor-Management Postwar Planning Committee, has made definite arrangements with a vocational school to conduct two electronics classes—one for its members and the other for the electrical workers of I.B.E.W. Local 494. The prescribed courses include both classroom and laboratory work. To permit a greater degree of individual attention to the students, registration for each class is limited to fifteen. If more members and electricians are interested, additional classes will be organized. The Association passes on the qualifications of the interested contractors and pays all fees, including registration, books and laboratory.

The subjects covered by the course, the first session of which is scheduled early in January, include the principles and applications of electronic control and such information as is at present available on radar. Jack Wilkenson of The Wisconsin Electric Power Company, Milwaukee, is the instructor.

Running concurrently with the above sessions will be another electronics school sponsored by the Electric League of Milwaukee for its members and members of the Electric Maintenance Engineers of Milwaukee. This course will consist of twelve sessions held on Monday nights from Jan. 10 to March 27 inclusive in the Public Service Building. The first four meetings, devoted to the fundamentals of electronics, will be handled by Ralph E. Welton of the General Electric Company. His background in this field and teaching experience on the subject, dating back as far as 1931 at the University of Wisconsin Extension Division, well qualifies him for the assignment.

The rest of the sessions will cover applications of electronic tubes in industry, with manufacturers' engineers handling the separate subjects. The tentative schedule includes the following:

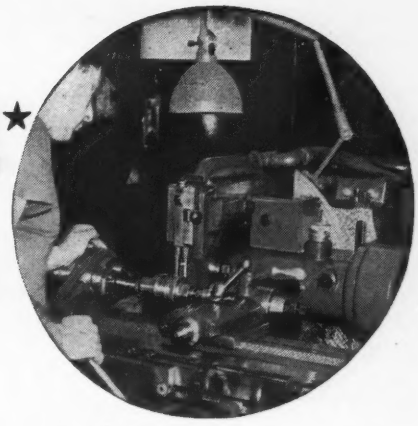
Jan. 10 to 31—Fundamentals of Electronics
Feb. 7—Rectifiers and their Applications
Feb. 14—Induction Heating
Feb. 21—Photo Cell
Feb. 28—Measurements
Mar. 6—Medical Applications
Mar. 13—Welding Applications
Mar. 20—Motor Control
Mar. 27—Preventive Maintenance

An attendance fee of $2.00 will be required of each registrant. However, 50 percent of this will be refunded to each registrant who attends 75 percent of the meetings. Forty-five applications were already received before the program was definitely organized and many more are expected to be filed before the first session gets under way.

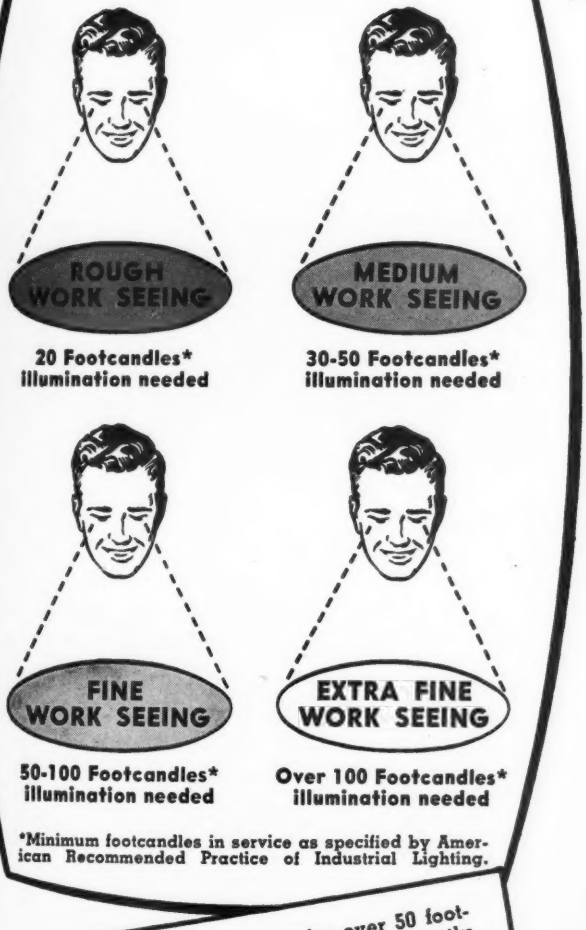
48-HOUR WEEK NOW EFFECTIVE

The 48-hour week was in effect by the end of last month in a majority of the 193 labor shortage areas, Chairman Paul V. McNutt of the War Manpower Commission announced recently. Among these areas, it was explained, were 69 in which acute shortages have actually developed. They are classified as Group I. The remainder,

Production *Vitamin BL*★ for ~~men~~ *Eyes* on Close-Seeing Tasks



HOW "SEEING" NEEDS VARY IN YOUR PLANT



*Minimum footcandles in service as specified by American Recommended Practice of Industrial Lighting.

★Many "seeing" tasks require over 50 footcandles which can be obtained efficiently and economically only by a combination of LOCALIZED lighting of needed high level directly on the individual work-area, and GENERAL lighting for overall work-area surroundings. Applied in the proper ratio, usually 5 to 1, the combination becomes BALANCED LIGHTING.

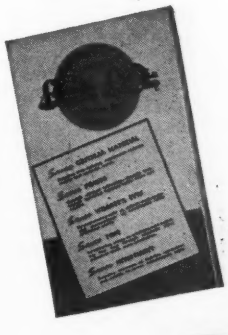
★"*Balanced Lighting*" stimulates Eye Speed and Accuracy—

In your plant every man on a close-seeing task is production-controlled by the "seeing" condition of his work area. The speed and accuracy of each worker is vitally dependent on the adequacy of light for seeing ***his*** exact operation. For different operations with varying "seeing" needs, efficiency with economy in lighting requires proportioned illumination to each worker in the quantity and quality ***he*** needs.

This is "Balanced Lighting." It provides primary illumination by direct lighting of each critical work-area to the high footcandle levels necessary for quick, accurate seeing of the task. It provides secondary illumination by overall lighting of surrounding areas at the lower level necessary for proper balance and ordinary seeing needs. Requiring a minimum of lighting equipment, "Balanced Lighting" also saves investment and results in lower maintenance cost.

Request an analysis of your plant lighting needs, today. A realignment of your present equipment may easily provide low-cost attainment of "Balanced Lighting" advantages.

THE FOSTORIA PRESSED STEEL CORPORATION
FOSTORIA, OHIO
IN CANADA — Write Amalgamated Electric Corp., Ltd., Toronto



***free* BOOKLET**

explains the efficient and economical results of "Balanced Lighting" and how to obtain it.

WRITE FOR A COPY, today!

PUT YOUR ILLUMINATION PROBLEMS IN THE HANDS OF QUALIFIED ENGINEERS

Fostoria Industrial Service Centers, located in principal cities, are specialists in industrial Lighting for Seeing. Their study and counsel on your lighting problems are available to you without obligation.

BALANCED LIGHTING
fostoria
GENERALITES for Overall Lighting • LOCALITES for Light ON the Job

classified as Group II, are those in which it is anticipated "acute" shortages will develop within six months.

Mandatory application of the 48-hour week in Group I areas was recently provided for in a War Manpower Commission instruction to field offices. Reports received from regional directors indicate that by the end of the year a large proportion of the 124 areas in Group II will also be on a 48-hour week. Nineteen of the Group II areas were on the 48-hour list when the instructions were issued in October. To these have been added 20 in which the longer week is in effect and regional reports make it appear likely that almost all will be working the longer week by January 1.

In applying the 48-hour week Chairman McNutt emphasized that no iron-bound rules had been laid down. In line with the policy that manpower problems for the most part should be settled in the communities where they develop, the local representatives of the Commission, working with labor and management, have made the exemptions which seemed to be demanded by local conditions. On that point, he explained they have a wide latitude as long as they adhere to the basic provisions that exemptions shall be granted only in cases where the longer work week (1) would be impractical because of the nature of operations, (2) would not contribute to any reduction of labor requirements and (3) would conflict with Federal, State or local laws or regulations.

H. L. MILLER HEADS ELECTRICAL ASSOCIATION

Howard L. Miller, widely known electrical contractor, was elected President of The Electrical Association of Philadelphia for 1944 at the annual meeting of the Board of Governors on December 14th.

Mr. Miller, who is president of the Utili-

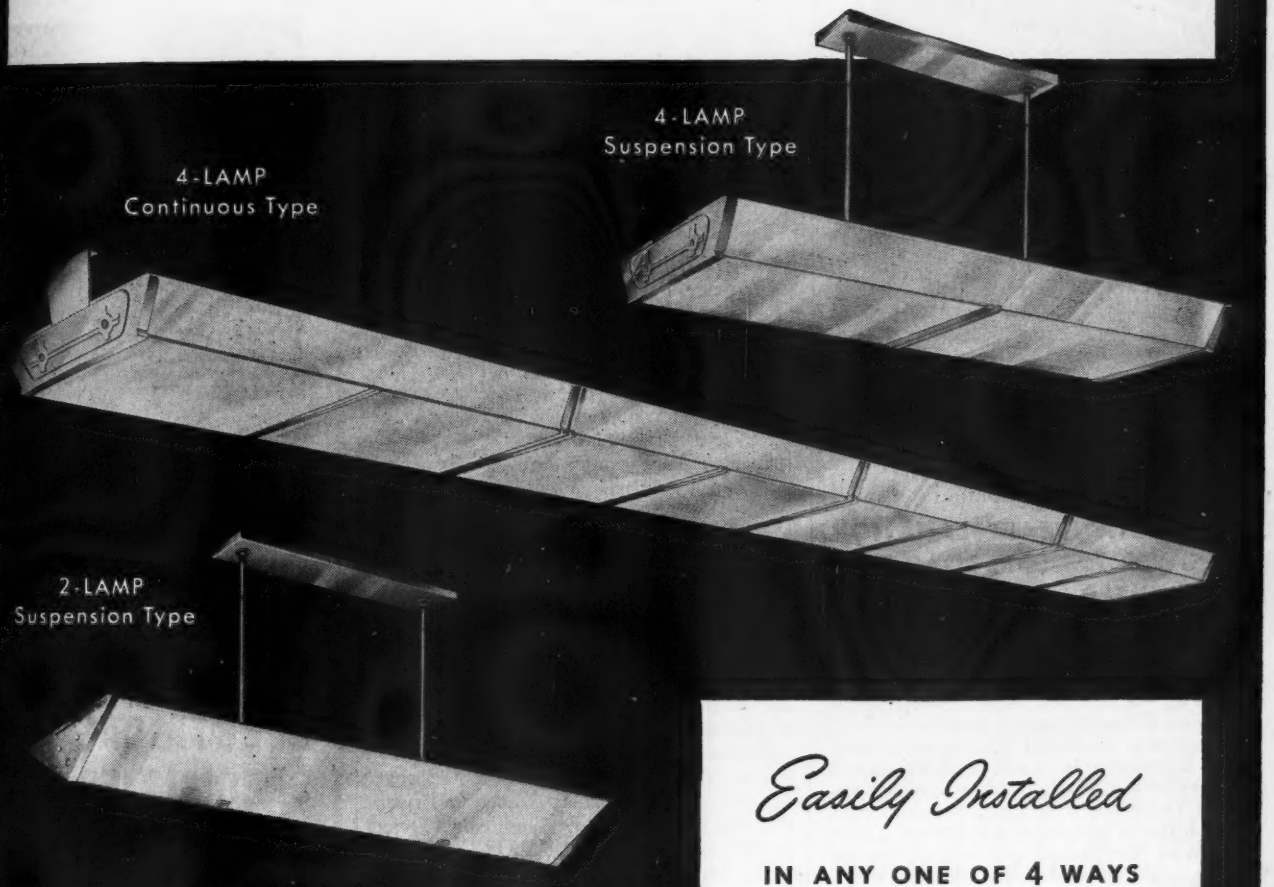
HOWARD L. MILLER

ties Engineering Company, succeeds A. L. Hallstrom, Vice President of Graybar Electric Co., Inc.

The other officers elected were: H. B. Bryans, Executive Vice President of Philadelphia Electric Company, Vice President; Philip H. Ward, Jr., President, Ward Elec-

New! FLUORESCENT Luminaires

FOR ESSENTIAL WARTIME APPLICATIONS



For better illumination of war-production offices and drafting rooms, Westinghouse introduces a new line of Commercial-type, Fluorescent Luminaires. Used as individual fixtures or for continuous strip installations, they furnish a wide range of high intensities . . . and without shadows or glare.

Handsome in appearance and sturdily built, these efficient luminaires are *now* available through 117 Westinghouse Electric Supply Company offices and Independent Westinghouse Lighting Distributors.

Get full details today! Or write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, Ohio, for bulletin B-3332.

Easily Installed

IN ANY ONE OF 4 WAYS

1. As individual units, with twin-stem hangers.

2. As individual units, mounted flush with the ceiling.

3. For continuous strip applications, with twin-stem hangers.

4. For continuous strip applications, mounted flush with the ceiling.

Westinghouse Commercial-type Fluorescent Luminaires are available with or without the glass panels illustrated above.

Westinghouse *Lighting Equipment*

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Tune in John Charles Thomas, NBC, Sundays, 2:30 P.M., E.W.T.

tric Company, Treasurer; and Robert J. Moran, Chief of Electrical Department, Middle Department Rating Ass'n., Secretary.

COMING MEETINGS

American Institute of Electrical Engineers—National Technical Meeting, Engineering Societies Building, New York, N. Y., January 24-28.

National Electrical Manufacturers Ass'n.—Spring Meeting, Palmer House, Chicago, Ill., April 24-27.

National Fire Protection Ass'n.—Annual Meeting, Benjamin Franklin Hotel, Philadelphia, Pa., May 8-11.

American Institute of Electrical Engineers—Summer Technical Meeting, Jefferson Hotel, St. Louis, Mo., June 26-30.

RESTRICTIONS WAIVED ON TRANSFER OF FABRICATED ARTICLES

Action to move into regular distribution channels inventories of fabricated articles or components made idle by contract modifications or terminations has been taken by the War Production Board.

Under a delegation of authority signed by Program Vice Chairman J. A. Krug, each of the WPB Regional Directors has been authorized to waive restrictions which have limited transfers of such articles and components.

Approval will be granted by the Regional Directors for transfers of idle material reported to WPB. Sales may be made only to a distributor or wholesaler who certifies that he is regularly engaged in the business of selling the material in the form in which it is being acquired.

The authority covers materials other than "Industrial materials" as defined in Priorities Regulation No. 13. The items affected by this announcement, therefore, are fabricated articles or components rather than raw materials. Each Regional Director may act only with respect to material physically located within his region.

It is not intended that the materials acquired by distributors as a result of such special transactions will be deducted in processing PD-1X applications for similar

CHARLES FRENCH, NISA president, (right) drives home a few postwar planning points as T. L. Rosenberg, NISA director from Oakland, Calif., relates west coast conditions at recent Central District Chapter, NISA, conclave in Chicago.

DEPENDABLE CONTROL

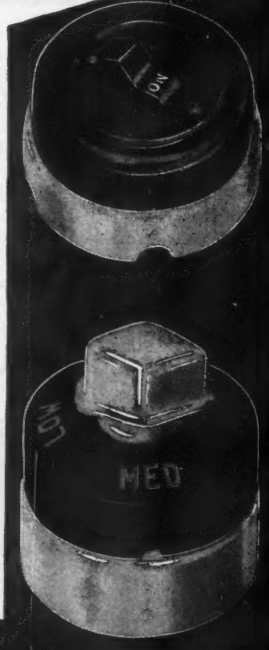
OF POWER aimed to destroy enemy forces

OF POWER aimed to sustain our forces

ARROW serves with dependable SWITCHES

Their service to the firing-line stems from flawless service at the production-line. "Hot wires", heavy loads, round-the-clock operating schedules, — these demand super-stamina in switches.

So install *or* replace with ARROW Switches for continuous, positive *ACTION* on production-lines. . . Heavy-duty controls for lighting and power circuits; specification-grade T-rated 10, 20 and 30 Amp. "Type C" Switches, Rotary Snap Switches, Ceiling Pull Switches, Door Switches, Flush Tumbler Switches with or without outlet box covers. You'll find in them the fighting Quality to *keep* functioning.



DISTRIBUTED THROUGH ELECTRICAL WHOLESALERS

ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U.S.A.

10 per cent to 5 per cent in calculating the ceiling price for the machinery item being sold. Additional study by OPA showed that the original rate was not in line with the rates allowed in other lines of machinery. No consumer articles are affected by this step since only equipment for industrial purposes is covered by the action.

Another provision limits the exemption from price control for cost-plus contracts. Under this step it is made clear that the exemption does not apply to machines and parts for which the seller had a published list price or established price in effect on the specified base date.

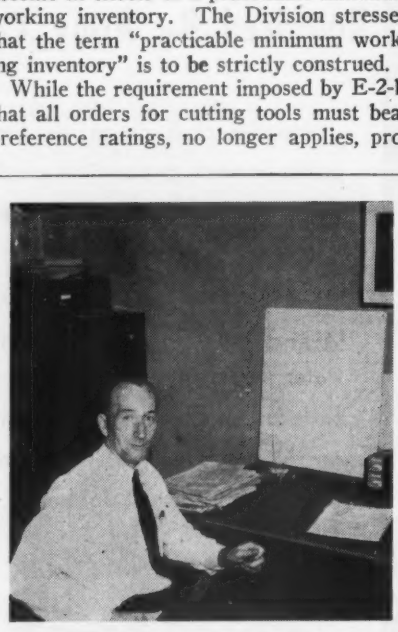
These provisions are made through Amendment No. 106 to Maximum Price Regulation 136 (Machines and Parts and Machinery Services) and became effective Dec. 1, 1943.

ORDER E-2-b REVOKED

General Preference Order E-2-b, which regulated the production and distribution of metal cutting tools, was revoked by the War Production Board.

In revoking Order E-2-b, the Tools, Division of WPB called attention to the inventory restrictions contained in Regulation 1, which state in part that unless specifically authorized by WPB, no person shall knowingly make delivery of any material and no person shall accept delivery thereof if the inventory of such material of the person accepting delivery is or will become in excess of a practicable minimum working inventory. The Division stressed that the term "practicable minimum working inventory" is to be strictly construed.

While the requirement imposed by E-2-b, that all orders for cutting tools must bear preference ratings, no longer applies, pro-



FRANK NAGY of E. J. White and Co., Newark, N. J., electrical contractors, keeps before him an up-to-date chart of active jobs. The board is composed of 16 rows of small nails on which is hung in the first vertical column the names of all active jobs. After each job is hung a string of one inch square white plastic tags. On each tag is written the names of the various keymen, foremen and sub-foremen working at that particular site. In this way Frank always knows where to contact the various men as the occasion arises.

PEORIA'S BUSINESS stability under wartime conditions is discussed by Walter W. Hendricks (center), Hendricks Electric Service, Peoria, Ill., as Joe Ferrari (left) and Chas. A. Kaska, Chicago motor repairmen listen attentively.

ducers must still fill rated orders ahead of any unrated orders that may be received.

All producers are requested by the Tools Division to continue to file monthly operations reports on Form WPB-39. These reports are all the more important now that E-2-b has been revoked, the Division said.

ORDER L-63 AMENDED

Suppliers who are required to keep inventory records under Limitation Order L-63 no longer need file Form WPB-825 (formerly PD-336), the War Production Board has announced.

Amendment of L-63 also provides that suppliers must keep records of total net monthly sales from stock and total inventory of supplies at the end of each month, but need not keep a separate record of each type of supplies.

Another change made by the revision clarified the meaning of the fourth exemption from the order by substituting the phrase "replacement parts specially designed to fit only one model and brand of machinery or equipment and adaptable to no other use" for the phrase "functional replacement parts for machinery and equipment."

DIR. 2 AND 15 ADDED TO L-41 AND CMP NO. 5

Action to facilitate the installation of processing machinery or equipment, or the relocation of any machinery or equipment within certain plants, if the cost of the installation materials is less than $500, has been taken by the War Production Board.

This move was accomplished by issuance of Direction 2 to Conservation Order L-41 and Direction 15 to CMP Regulation No. 5.

Permission to install processing machinery or equipment or to relocate all kinds of machinery or equipment is limited to factories, plants and other industrial units having a productive floor area of 10,000 square feet or more which do not make products listed on Schedule A of L-41.

Under Direction 15 to CMP Regulation

5, MRO ratings and allotments may be used by persons on Schedules 1 and 2 of the Regulation to get the installation materials required for these jobs.

The amount spent in construction permitted by Direction 2 is not limited to and need not be deducted from the amount allowed for construction under paragraph c of L-41.

MADISON PLANS ORDINANCE REVISION

The postwar plans of the electrical inspection department of the City of Madison, Wis., include a thorough study and revision of the present electrical ordinance with an eye toward further elimination of electrical hazards and a general upward revision of restrictions. City electrical inspector, E. M. Michelson reports that preliminary drafts of the changes are already being studied.

A composite committee of electrical men are working on the project. Representatives of the various electrical groups include: Wm. C. Schlosser, Capital Electric Co., contractors; Arthur Lundholm, president, Local 159, IBEW, labor; B. I. Church, Fire Insurance Rating Bureau; Ray Burt, building inspector, City of Madison; Wm. Farmer, inspector, Town of Madison; Neil Brown, inspector, Town of Blooming Grove; Walter Schar, secretary, Fire Insurance Writers; Louis Siberz, architect;

QUARTER CENTURY MARK, J. Walter Collins, secretary of the Electrical Contractors Association of City of Chicago, has rounded out 25 consecutive years of service with the association. Under his direction, the Research Department of his organization, the first of its kind in the industry, has flourished and poured out reams of authoritative statistics on construction and operating costs. Besides that he is active in the labor relations field, directing the operation of the Insurance Trustees, in insurance and unemployment trust fund for Union Employees of the members, and participating in the NECA, Federal and local Apprenticeship Training programs. In tribute to the occasion, the association directors presented Walter with a winter vacation trip to Phoenix and Tucson, Arizona.

and E. M. Michelson, electrical inspector of the City of Madison.

Outstanding among the suggested changes is a clause which calls for the reinspection of an electrical system before a utility meter can be reconnected, relocated or installed. Prime goal—to prevent the projection of existing electrical hazards from tenant to tenant. Enforcement of all changes, upon approval, will be withheld for the duration or until such time as the necessary materials to correct hazardous conditions are made available to the industry.

FORM WPB-547 MAY BE REVISED

Wholesalers and retailers, who use Form WPB-547 (PD-IX) to apply for priority assistance in obtaining scarce goods, are cautioned not to order supplies of this form for more than immediate needs, the War Production Board has said. A simplified version of PD-IX is under consideration, and is being submitted by the Wholesale and Retail Division of WPB to appropriate Industry Advisory Committees.

The new form, if adopted, will require less time to fill out and less time to process at the War Production Board. Any changes will be made public well in advance of the effective date, probably some time in January.

RESTRICTIONS ON MANUFACTURE OF CIRCUIT BREAKERS REMOVED

The War Production Board has removed the restrictions contained in Limitation Order L-300 which prohibited the manufacture of circuit breakers containing shunt trips, under-voltage trips, auxiliary indicator switches or bell alarm switches.

The amendment was found advisable when investigation disclosed that many manufacturers purchasing circuit breakers without such safety and indicator devices were installing their own supplemental equipment due to the shortage of skilled manpower, and generally using larger quantities of critical materials than if the safety and indicator devices were installed by the circuit breaker manufacturers.

COLLATION OF MPR NO. 136 AMENDMENTS

As an aid to the machinery industry and its 40,000 related establishments throughout the country, the Office of Price Administration has issued a collation of Maximum Price Regulation No. 136 (Machines and Parts and Machinery Services), which gathers together all amendments since the issuance of the regulation.

The regulation provides unified price control for practically all types of machines and parts. The collation, the first issued since June 30, 1942, will provide the machin-

cery and services trade one convenient reference to the price regulation affecting this diverse industry. Previously, it was necessary for persons seeking the proper provision of the regulation applying to his machine or part to search through the many amendments for the answer to his pricing problem.

Under the collation, the manufacturer will now find particularly helpful the carefully compiled index. This will serve as a quick reference to any particular phase of the regulation including the thousands of dissimilar products under control in these highly complex industries. Many added problems of pricing in the machinery industries have risen as a result of the war and the numerous parts used in the construction of such combat material as airplanes, tanks, trucks, and countless other items used in mechanized warfare.

This collation covers the regulation through Amendment No. 106, which has just been issued.

FORM WPB-2570 TO BE FILED WITH DISTRICT OFFICES

Applicants for construction costing less than $10,000 were advised by the War Production Board that they will save time by filing Form WPB-2570 (formerly PD-200-c) with WPB District Offices instead of sending their applications to Washington.

Under Order L-41 as amended November 1, Form WPB-2570 must be used for applications for construction costing less than $10,000 and must be filed with district offices. Form WPB-617 (formerly PD-200) is used for construction costing more than $10,000 and must be filed with WPB in Washington.

Unless this procedure is followed, the applicant will face unnecessary delay by having his application returned with instructions as to proper filing.

CAPACITORS TRANSFERRED TO RADIO AND RADAR DIVISION

Scheduling jurisdiction over capacitators for power factor correction has been transferred to the WPB Radio and Radar Division from the Power Division. the War Production Board has announced. This change, effected through shifting the item from Table 8 of Order M-293 to Table 9 of the same order, results from the fact that the Radio and Radar Division is more directly concerned with such capacitators at present.

PROCEDURE FOR PURCHASE OF HAND TOOLS

Procedures under which employees may use their employers' MRO preference ratings if they are higher than AA-3 to pur-

chase hand tools and safety equipment have been broadened in order that they may be used in connection with MRO ratings assigned under "P" and "U" orders as well as with ratings assigned under CMP Regulations No. 5 and 5A, was announced by the War Production Board.

At the same time, the scope of items to which the procedure is applicable has been broadened to include more things that an employer needs.

Provisions to encourage employers to permit their employees to use their ratings for the purchase of hand tools have been written into the regulation. The procedures, established under Direction No. 4 to Priorities Regulation No. 3, do not require that employers deduct their employees' tool purchases from their MRO quotas.

The procedure to be followed by employees is simple. They may use their employers' preference ratings for purchase of hand tools and safety equipment if they have a simple certification signed by the employer as follows:

Preference rating (specify rating) . . . . . MRO.

The following item . . . . . only one may be placed on each certificate; specify type and size of tool, or give name of other item) is required by the undersigned employee for use only in the undersigned employer's business, and the undersigned employer requires the employee to furnish the item. The undersigned employee further certifies that he does not own or possess any similar items which will serve the same purpose.

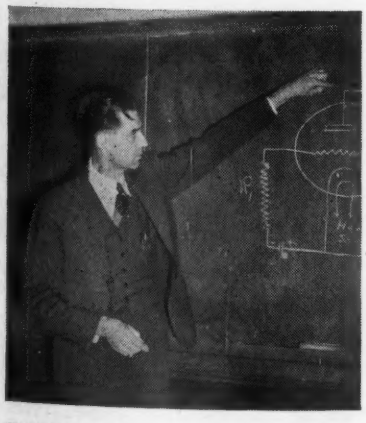
. . . . . Name and address of Employer

. . . . . Authorized Signature

. . . . . Signature of Employee

. . . . . Position

However, it should be noted that employers' preference ratings may be used by employees only to purchase hand tools and similar equipment and safety equipment needed for use exclusively in the employers' businesses and which the employers require that the employees furnish.



INSTRUCTOR V. H. Hansen explains the internal operation of electron tubes to contractors attending the Cook County Electrical Contractors Association electronics course at the Illinois Institute of Technology in Chicago.

ORDER L-206 AMENDED

Controls over the manufacture and distribution of X-ray equipment are relaxed by the War Production Board through issuance of Amendment of General Limitation Order L-206. Former controls established by L-206, originally issued in October, 1941, were necessary to break the bottleneck in filling military orders. In general, military orders are now being filled on schedule.

The amended order, a complete revision of the former order, is designed to provide adequate equipment for civilian use without the paper work formerly required by special authorization of civilian purchase orders and by the filing of production and shipping schedules.

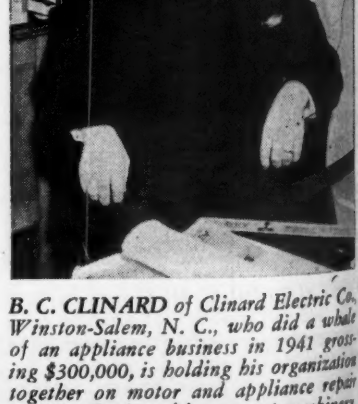
Chief provisions of the amended order are:

Shipments of medical X-ray equipment for civilian use are placed on a quota basis. Annual shipments of each manufacturer are limited to 75 per cent by dollar value of the average annual shipments made during 1937, 1938 and 1939. Quotas apply only to shipments within the United States, to its possessions and territories, and to Canada.

Medical X-ray equipment for the U. S. and Canadian military services and for export under Lend-Lease and OEW (now part of the Foreign Economic Administration) is not included in the quota. Industrial X-ray equipment is also outside the quota.

Monthly reports of shipments by dollar value are required; they are to be made by letter. Production and shipping schedules (Form PD-774) and authorization applications (Form PD-556) need no longer be filed.

Coverage of the order remains unchanged. X-ray equipment, as defined, includes only power units; radiographic, fluoroscopic and therapy tables; photo-fluorographic units; cassette changers; and tube stands. It does not include parts, accessories or appliances or rebuilt and second-hand equipment.



B. C. CLINARD of Clinard Electric Co., Winston-Salem, N. C., who did a whole of an appliance business in 1941 grossing $300,000, is holding his organization together on motor and appliance repair and distribution of farm pump machinery.

SHOP SUPT. Edward Breckwoldt is busy as the proverbial bee these days speeding up the motor repair jobs of Best Electric Company, New Orleans.

AMENDMENT FOR DETERMINING ESSENTIALITY OF AN ESTABLISHMENT

The War Manpower Commission has announced the amendment of instructions for the determination of the essentiality of an establishment by providing that the end-use of a product be considered as an additional test.

The essentiality of an establishment, it was explained, depends not only upon its being engaged in an activity included in the List of Essential Activities, but also upon the extent to which the product or service is used to meet war needs or minimum civilian requirements under wartime conditions.

The War Manpower Commission's ruling in earlier instructions, which are still in effect, provided that whenever the essential and unclassified activities are not separate, as in the case when the same workers are engaged in both departments, the establishment will be classified as essential only if 75 percent of its activities are devoted to production of items on the essential list.

AG ENGINEERS SEE REA EXPANSION

A heart-warming note for the rural electrical contractor came out of the recent midwinter conference of the American Society of Agricultural Engineers held at Chicago's La Salle Hotel. Based on comments of Grover C. Neff, president, Wisconsin Power and Light Company, the boys will be kept plenty busy after the war. "Rural electrification will go ahead rapidly in the future . . . R.E.A. cooperatives will expand rapidly in the postwar period . . . power and light companies will also continue a rather rapid extension of their lines . . . within ten years after the war, at least four million farms will be using 24-hour electric service," he predicted. About 1½ million of this total will be farms that at present have no electric service.

Today, the farmers use almost twice as

much electricity as the average urban customer, he continued. During the year ending December 31, 1942, the average farm served by utilities used about 180 kilowatt hours per month, those served by R.E.A. cooperatives, about 100 kilowatt hours per month. The big job of the future is to promote the use of electricity to its greatest possible advantage on the farm, he concluded.

Discussing farm electric equipment to meet postwar requirements, George W. Kable, editor, *Electricity on the Farm*, related the need for a nation-wide farm rewiring program during the interim between V-day and the time such equipment will become available. Many farms have been wired for period in excess of 10 years and many of those wired since have inadequate installations, he disclosed. He urged that greater attention be given to the safety of farm electrical systems in the future. Farmers must be sold "dollars saved in production" and not merely kilowatt hours, he concluded.

In presenting the present challenge of rural electrification, C. H. Leatham, vice-president, Monongahela West Penn Public Service Co., pointed out the need for preserving the small family type farm in the postwar economic picture. Practical, low priced, machinery and equipment must be developed, he continued. Additional stress must be applied to the use of electricity for productive purposes on the farm, he added, and suggested that the same method of promoting home electrification be used to promote farm electrification—with the pooling now, of all efforts and resources to develop the largest potential farm market.

At a symposium on electric aids in farm production, C. P. Wagner, district engineer, Northern States Power Co., outlined some of the salient farm wiring problems. He placed special emphasis on the need for materials to withstand the moisture and acid conditions in farm buildings and the danger of grounding farm wiring systems to water pipes. He recommended separately driven ground and overhead pole line distribution to facilitate future expansion and rehabilitation of such systems. J. D. Rankin, Detroit Edison Co., and L. C. Porter, General Electric Co., outlined respectively the application of grain elevators and heat lamps to farm production problems.

H. S. Pringle, chief, farm supplies and repair section, Office of Civilian Requirements, presented a somewhat hopeful picture of the supply and distribution of farm electric equipment for 1944. Idle labor and material will soon be used to start production on civilian items where conversion can be made in a hurry, he revealed. Commenting on the production of a.c. fractional horsepower motors, he revealed that for August and September, 1943 production was 239,000 and 253,000 respectively. About one-half of these were for industrial and civilian use. When the industry reaches its capacity, about 300,000 fractional horsepower motors will be produced per month. Few, however, will reach household appliances. One of the reasons—about 200 fractional hp. motors are used in a single bomber.

The following is the household appliance picture he painted—about two million electric irons of a limited design will be produced by spring; one-half to one million

refrigerators will be wanted and if luck holds out, one-half that number will be made—greatest bottlenecks are controls and compressors, as manufacturers of these items are making items for the planes and ships; within three or four months it will be easier to get nichrome wire, easing up production of heating appliances—about 54,000 (perhaps more) war model, three burner, electric ranges will be made.

Other subjects discussed at the electrical section meetings included: Vo-Ag School maintenance programs for electric equipment. James B. Stere, West Penn Power Co., revealed that some 7,500 such schools in the U. S. have ½ million day students and about 227,000 evening students. The Pennsylvania Electric Association is distributing 12 Bulletins on the care and operation of various farm electric equipment to such schools in the state.

H. J. Gallagher, Consumers Power Co., related that 240 electric motor maintenance clinics were attended by 9,600 farm people in Michigan. Farmers are taught how to keep motors and electric equipment clean, how to repair broken extension cords and similar small repairs. If a motor is damaged beyond that extent, however, the farmer is urged to have a motor service shop repair it.

A report on the results with home dehydrators was presented by G. E. Henderson, T.V.A., who stated that dehydration ranks first in low cost food processing, but that improper packaging and poor storage are its present pitfalls. Miss Gilma Olson, assistant professor of home economics, Pennsylvania State College presented an interesting and factual paper, on the freezing of fruits and vegetables in domestic freezer cabinets, prepared by J. E. Nicholas, professor of agricultural engineering at the same school.

Book Reviews

ELECTRONIC CONTROL OF RESISTANCE WELDING

The resistance welder has made a great contribution to the war effort by increasing production many-fold. Since this welder is electronically controlled, its principle of operation is new to most industrial men.

"Electronic Control of Resistance Welding" is a new book written by George M. Chute, a General Electric application engineer of Detroit, Mich. to meet this need of industrial men for information on basic operating principles. It is written especially for the non-engineers in layman language.

The complete control is broken down into its various separately-operating components; such as the ignitron contactor, the electronic time-delay relay, the automatic weld timer, the thyratron trigger circuit, etc. Then after a thorough discussion of each, the components are assembled into the complete control unit with a thorough discussion on the integrated operation.

This new book is the result of a course given by the author and his co-workers to hundreds of industrial men in the Detroit area. From these men the author has

learned the information they need in caring for this equipment.

The book is divided into three parts: Ignitron Contactors, Tubes and Weld Timers; Synchronous Control of A.C. Welding; and Energy Storage Welding. Some of the thirty chapter headings are: The Ignitron Contactor, Instruments for Checking Tube Controls, The Time-delay Relay, The Thyratron Tube, Maintenance and Trouble-Shooting Weld Timers and Sequence Controls, Starting and Maintaining the Synchronous Panel, Capacitor Storage, and Reactor Storage.

The material is given complete and exceptional treatment on the subject of electronic circuits. The book is titled "Electronic Control of Resistance Welding" by G. M. Chute and published by McGraw-Hill Book Company, New York, $4.00.

LIGHTING HANDBOOK

Designed as a practical guide and working reference book for lighting engineers, designers, architects and builders, the Lighting Handbook was prepared by the Westinghouse Company's Illuminating Engineering Department.

A feature of the handbook is a series of charts which coordinate room index, fixture efficiency and coefficient of utilization curves and provide a new and graphic method of determining the desired illumination for various applications. Charts cover industrial and commercial fluorescent and incandescent lighting and provide a means of calculating quickly the number and size of lamps needed with practically every type of lighting fixture.

The book is divided into two parts, chapter headings in the first section including: Lighting Terms and Measurements, Recommended Levels of Illumination, Interior Lighting Design Calculations, Interior Wiring for Lighting. In the second half of the book, devoted to specific lighting applications, there are chapters covering store, office, school, public buildings, industrial, architectural, aviation and street and highway lighting.

"Lighting Handbook", 175 pages, Westinghouse Lamp Division, Bloomfield, N. J. $1.00.

MANUFACTURERS NEWS

WESTINGHOUSE CHANGES

Two new managers in the Industry Department of the Westinghouse Electric and Manufacturing Company have been appointed. They are C. F. Lloyd, manager of the General Contract Department and Tomlinson Fort, Manager of the Central Station Department. Head

quarters of both men will remain at the East Pittsburgh plant.

Charles H. Weaver has been appointed manager of the newly formed Marine Department, and will direct all commercial activities. This responsibility includes the coordination of marketing of the diversified products of the company that are used for marine service.

G-E APPOINTMENTS

E. H. Fritschel has been named sales manager of Transmitting Tubes, and H. J. Mandernach, sales manager of Receiving Tubes in the Tube Division of the General Electric Company's Electronics Department. Both men are located in Schenectady, N. Y.

Frank W. Warner has been named successor to Henry M. Richardson as chief engineer of the Plastics Divisions.

The General Electric Lamp Department's Atlantic District, New York City, announces the affiliation of H. E. D'Andrade as a consultant on architectural lighting problems.

FAIRBANKS-MORSE PROMOTIONS

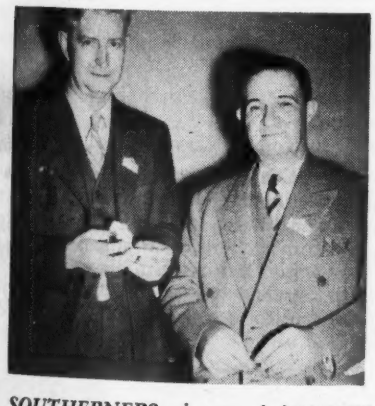
Changes in personnel have recently been announced by R. H. Morse, Jr., general sales manager, Fairbanks, Morse & Co., Chicago, Ill. These changes are as follows:

O. O. Lewis, formerly branch manager, Atlanta, Ga., has been promoted to the position of assistant general sales manager of the company, Chicago.

V. O. Harkness, former manager of the company's branch at Dallas, Texas, has been appointed manager of the Diesel Engine Sales Division, Chicago.

H. J. Renken, former manager of the Oil Field Division at Dallas, has been made branch house manager of the company's Dallas branch where he will continue to serve as manager of the Oil Field Division in connection with his new duties.

J. S. Peterson, formerly Scale Depart-



SOUTHERNERS who attended NECA'S recent Chicago conference are (L to R), W. O. "Slim" Henderson, Jacksonville, Fla., and J. M. Richardson, Richard-Wayland Electric Corp., Roanoke, Virginia.

ment manager of the Cincinnati branch has been promoted to the office branch manager replacing the late Stanley Eaton.

G. N. Van Epps, formerly manager of the Diesel Department, Chicago Branch has been named manager of the branch at Atlanta, Ga.

ZINSMEISTER ELECTED PRESIDENT

The Board of Directors of Pittsburgh Reflector Company has elected H. C. Zinsmeister as president, succeeding E. W. Simons, who has retired.

ZINSMEISTER

Mr. Zinsmeister joined Pittsburgh Reflector Company in 1934 and served as auditor until 1940, when he was elected treasurer. He is well known in the lighting industry and in accounting and banking circles throughout the Pittsburgh district.

CANNON REPRESENTATIVES

The Cannon Electric Development Company, Los Angeles, Calif., has announced the following new engineering representatives: E. B. Glenn, 801 Healy Bldg., Atlanta, Ga.; Douglas H. Loukota, 10 Light St., Baltimore, Md.; Ray Perron & Company, Little Bldg., Boston, Mass.; H. M. Welch, Crosby Bldg., Buffalo, N. Y.; George Sturman, 712 Sixth Avenue S., Minneapolis, Minn.; J. Tinsley Smith, 108—17th Avenue S., Nashville, Tenn.; J. W. Beneke, St. Louis agent for E. L. Melton, at 575 Arcade Bldg., St. Louis, Mo.

Graybar Electric Company has named R. B. Sayre as manager of its Memphis office. He was formerly manager, Outside Construction Department, at the Atlanta office. Mr. Sayre replaces O. B. Chandler, who died recently after 20 years of continuous service with the company.

The Crocker-Wheeler Electric Division of the Joshua Hendy Iron Works, announces the appointment of R. D. Ulrey as manager of its new Los Angeles, Calif., office. This new office, located in the Pacific Mutual Building, 523 West Sixth Street, will provide coverage for Southern California, Arizona and New Mexico.

Standard Transformer Company, Warren, Ohio announces the appointment of J. S. Buchsbaum as sales promotion manager. He was formerly connected with the Ohio Public Service Company.

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financial licking until the postwar period when increasing volume will automatically reduce the fixed charges in ratio to sales. Nevertheless, this ratio should be always kept in sharp eye focus so that you never let your fixed expense loom so high that you can't effect economies when sales tailspin. We have known cases where the fixed-to-variable ratio ran 6 to 1 without serious results when times were prosperous but when sales dipped, a wipe-out of the entire variable expense, all the reduction possible, would not have prevented an operating loss.

Although you may be unable to do anything about a high fixed ratio now, this phase of overhead requires watching in the postwar period so it is important that you acquire understanding at this time in order to operate profitably after the war when contractors will buy new equipment, modernize and expand to meet the heavy demand for electrical goods and service certain to materialize then. This fixed outlay will mean increase fixed expense that you can't cut when the eventual letdown comes, which it always does after the fat years. In the postwar period of expansion, give cognizance to the loading of fixed burden and not let it get out of ratio to variable expense or you will eventually pay the Piper.

Contractors, like Jones, with high fixed expenses, should try to keep them in safe ratio to sales. Contractors, like Smith, with a low fixed ratio, will have an easier time of it for the duration. Variable expenses, such as light and office expense, can be cut directly but fixed expense must be reduced indirectly by increasing volume and, in most cases, sufficient volume isn't obtainable now. Of course, direct cuts can be consummated by refinancing a mortgage at a lower interest rate or sub-letting part of a business property but these adjustments are seldom achievable. If your variable to fixed ratio today is about 3 to 1, you are in the safety zone, if our field studies are any criterion.

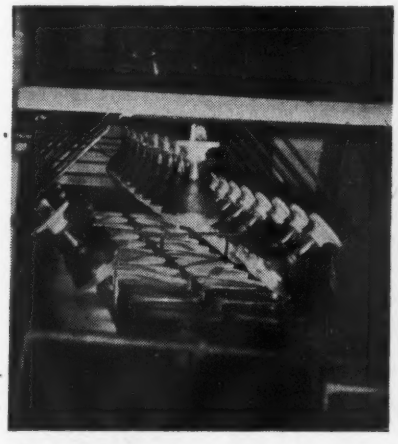
Fixed expenses are rent or ownership expense, taxes, interest on long-term indebtedness, such as mortgages, depreciation and any other item covering an extended period. Variable expenses are those that can be cut at any time, such as light, repairs, salaries, supplies, advertising, etc. Insurance may be fixed or variable, depending on the times. Today, with inventories slimmed, fewer employees and lower mileage of rolling stock, insurance is variable. It can be cut. In more stable times, insurance approximates fixed expense. High taxes are another reason why the contractor should watch the fixed to variable ratio from now on. Tax will "up" the fixed ratio, necessitating closer scrutiny of this important phase of overhead to keep it in the safety zone.

INFRA-RED SOLVES A DRYING PROBLEM

INDUSTRIAL

R. E. Powell, chief electrician for Philip Morris & Company of Richmond, Va. has been experimenting with infra-red for the past several years. His tests have resulted in some interesting applications with more to follow as soon as critical materials again become available. One installation is striking with respect to speed up and cost reduction.

Tax stamps must be pasted to every box of tobacco before shipment and if not allowed to dry properly before handling in packing, the stamps will slide around, come loose and flake off. To speed this drying, ovens were designed and built some years ago that would dry the stamps in 60 seconds. This was good.



INFRA-RED OVEN temporarily installed until production lull permits permanent installation. Note fan motor on old oven in background. It now takes only 30 seconds for the familiar Bond Street box to pass through an infra-red oven which has replaced an air conditioned drying unit.

The development was not without its headaches however. The oven amounted to a "volume" heat process. In other words, to dry the stamp, so much heat was applied that it penetrated the tobacco. This was bad. For after spending years perfecting a process that would produce uniform moisture-content tobacco, an oven, used to dry the tax stamp, also dried the tobacco, ruining it.

Consequently, a temperature-humidity system and control had to be installed which would still dry the stamp but allow the tobacco to retain the same moisture content. This of course was not only an expensive proposition from an initial installation cost standpoint, but also from the standpoint of operational cost. The unit entailed the use of four motors, a huge box of an oven, a refrigeration system, and a steam system. The refrigerating and steam piping systems had to be balanced against each other to produce an unvarying condition of temperature and humidity. Naturally, each reduced the efficiency of the other so that along with the energy consumption of the motors, it resulted in comparatively expensive operational costs. Yet it was economical because of the speed-up in drying time.

Then the results of Mr. Powell's experiments hit pay dirt in infra-red application. Here was a drying vehicle which could be made to "surface" dry only. This was good. For the heat from the lamps was of sufficient intensity to dry just the surface provided the boxes were passed through fast enough.

However, a series of tests proved that an exposure of 30 seconds would dry the stamps without penetration of heat into the tobacco. Conveyor speed remained the same as that used with the old oven but length of travel has been halved, cutting drying time likewise to half.

To give the boxes this 30 second exposure, the bank of infra-red lamps consists of 24 in number and are divided into three rows of eight lamps each. They are mounted on longitudinal centers of six inches and are focused as in the accompanying photograph. Lamps are silver reflector type rated 250 watts.

The four-inch boxes which hold the porcelain sockets and lamps are mounted on lengths of strap steel bent to give the desired focus. At present these brackets are temporarily supported by "two by fours" resting on cardboard boxes and "shimmed-up" to the proper height by several thicknesses of cardboard shims. As soon as a production lull permits, changeover to a permanent installation will be made. The infra-red oven has been placed just ahead of the old oven (now out of service) so that by the time the box passes through (one minute), the stamp is thoroughly dry and the box is cool enough to handle.

No guess was ventured as to the reduction in energy cost but it is known to be considerable. It was estimated that the installation cost of the infra-red oven was only a few percent of that of the original drying unit, which included refrigerating unit and coils, steam piping and coils, oven, and four motors plus a multiplicity of control.

Control Board Directs Maintenance Scheduling

[FROM PAGE 139]

known to lock rotors on starting. This condition, of course, calls for disassembly and thorough cleaning. Then a tan peg is placed in each row under the first and third week of each month. Groups 11 through 25 need blowing out only once every other month, so black pegs are placed in each row (11 to 25) under the second week of every other month. The same procedure is carried on for all the maintenance responsibilities of every piece of electrical equipment in the plant for the entire year. These responsibilities include everything from cleaning and oiling to contact inspection, insulation testing, and load checking (by clamp-on type meters).

The cards carry information pertinent to the equipment. Every piece of apparatus in the plant has been tagged and the card is identified with a specific motor by this tag number. Complete nameplate data is carried along with dates, results of tests, replacement parts used, etc.

As explained above, each file group corresponds to two horizontal rows of holes, the upper for the colored indicator peg and the second for the tape peg. If the tape peg is placed alongside a certain colored peg, it means that all tasks to and including that one have been carried out. The daily date-line is moved each day to give at a glance the last minute report on all maintenance work. Marshall merely needs to look at the date-line and if all tape pegs are up to it, then all is well. If not, he wants to know why.

In case one of the electricians comes across a bad condition that cannot be repaired on the spot, say in one of the controls, he notes it on his work order and the office clerk posts a red peg alongside the date-line in the proper row. This red peg remains there until the condition is corrected. If it goes too long an investigation is made as to why.

Paper Work

The paper work is considerable but well worth it. The office clerk each day issues orders that the boys pick up the following morning. As the date-line hits consecutive rows of pegs, it is the clerk's responsibility to see that work orders are issued for every piece of equipment noting specifically what is to be done. The orders come back that afternoon and all pertinent data therefrom recorded and filed.

At the present time only a portion of the board is in use. However, by the end of the transition period from the old to the new system of tabulating and filing, all space will be completely utilized. Further, this transition has been slowed to allow a certain amount of experimentation, so that when the complete board goes into service it will carry all the requirements for A-1 operation.

Power Factor Correction

One interesting development has already made its appearance (the board has only been in service a few months). Load checks are being made on all drives to determine their exact loading and many have been found, to date, considerably underloaded. The men carry with them at all times clamp-on type meters as standard maintenance equipment so that a load check can be made each time equipment is worked on. In the future as new motors are needed, they will be ordered for application to loads that are overmotored. The motors that have been replaced will then be used for the new drive. For example, a 10 hp. motor is needed for a new machine. Looking through the files Marshall finds a 10 hp. motor of the right speed which is only pulling a little better than 4½ hp. He therefore orders a 5 hp. motor to replace the 10 hp. motor and uses it for his new drive.

His objective is to raise his plant power factor. During the summer he has a good power factor as a result of a heavy synchronous load on refrigeration compressors for air conditioning. However, during the other eight months of the year the synchronous motors are not used and the power factor drops considerably. With this new program he expects to bring about a decided increase in his year around power factor.

Protects Production

He is very enthusiastic about this latest development in his preventive maintenance program, for he has found from years of practising scheduled maintenance that it is the only way to prevent unanticipated outages with their consequent disastrous effect on production. With a production rate of thousands and thousands of cigarettes per minute it doesn't take much figuring to calculate the number lost in an hour's shutdown. It is easy to see why *good* maintenance is so important. And maintenance is never *good* unless it is preventive maintenance carried out on a rigidly scheduled basis. This is definitely one of the best examples to be found anywhere.

Fluorescents Provide Localized Lighting

[FROM PAGE 45]

jig. The jig is supplied with a total of eight receptacles providing each assembly, in each jig, and from either side, a readily available source of power.

Fuselage Jigs

Fuselage jigs, in which the main body of the plane is fabricated and assembled, are also portable and can be moved, if necessary, to any convenient location in the production schedule. Here again each jig is provided with its own localized fluorescent lighting built onto the jig as an integral part of it. However in this case, the further advantage is provided in that the positioning of the fixture is adjustable.

At one corner of the jig, a heavy iron pipe riser supports a boom of sufficient length to swing the fixture out to a point directly over the center of the fuselage. To the end of the boom is hung a short wooden beam in swivel fashion. Then, the fixture which is hung directly from the short beam can be turned through an angle of 180 degrees. At whatever point a concentration of light is required, the fixture can be oriented to give the desired results.

Flexible cord runs from the snap switch on the side of the jig, up the iron pipe and over the boom to the fixture. To counteract the weight of the fixture on the end of the boom, an extension of several feet was added to the length of iron pipe. From the end of this extension, a wire cable is dropped diagonally to the end of the boom to support part of the weight. Here again two 100-watt 3500 degree white tubes are used in the fixture which is mounted about four feet above the average working level.

Portable Fluorescent Units

At many points in the assembly line, a portable source of light was needed to get sufficient light up under the plane belly for critical assembly work. To do this job, the plant electrical engineer designed a portable stand that would carry a two-lamp unit using 100-watt tubes.

To protect the tubes against breakage, a wire screen, of width and length to cover the entire face of the reflector, was nailed to two long strips of wood. The wood strips were then rolled back over the edges of the reflector and held in place by metal straps. The metal strap was nailed to one wooden strip, pulled tightly across the ballast atop the reflector, and nailed to the wood strip on

the other side. Strapping was done on each end.

A short piece of angle iron was then bolted to each end of the metal channel enclosing the ballast case, and these in turn were bolted to a slotted cross-beam. One bolt and wingnut then held the cross-beam to the stationary upright so that the fixture could be raised or lowered and could also be set at any desired angle.

In addition to these portable stands developed and built at Eastern Aircraft, a great number of small portable fluorescent reflectors using 20 watt tubes have been provided to furnish up-under light on the assembly line. Specially designed hooks have been attached to these units so that a total of six (three on each side) could be hung in the bomb-bay during assembly operations in that area.

Summary

Fluorescent has the advantage over the incandescent in instances of local lighting where the worker is close to the source and where the source wattage is comparatively high in order to reach desired illumination levels. Employee comfort is increased by using a notably cool source such as the fluorescent tube. Further, since it is not a brilliant source, no brilliant reflections or shiny surfaces are present to cause eye fatigue. And due to even light distribution, shadows are reduced to a minimum.

This installation is outstanding not only in view of its application of fluorescent to localized lighting but also because of the portability aspect of the complete design increasing production flexibility to a maximum.

NEWCOMERS in the motor service industry are Clyde Baker (left) and Elmer Franzen of the newly organized Wm. Keck and Sons Motor Service Shop in Joliet, Ill.

Fundamentals of Electronic Tubes

[FROM PAGE 47]

high (high operating temperature), the inverse voltage at which flash-back occurs is reduced considerably. The filament of a gaseous tube should be allowed to reach full operating temperature before the anode voltage is applied or the tube drop will exceed the cathode disintegration voltage and permanently damage the filament or cathode.

B. *Three-element Gaseous Tube—Thyratron*

The addition of a control grid to the previously described two element tube increases the versatility and application of the gaseous tube. The grid control in a gaseous tube is different from that of a triode vacuum tube in which the grid has complete control over the magnitude of the anode current at all times, while the grid in a gaseous tube performs only a trigger function. For a thyratron with positive anode, the grid is able *to initiate or start the current flow, but it cannot control the magnitude of the current or stop the current flow once that it has started.* The only way that the anode current can be interrupted is to reduce the anode voltage to a value below the gas ionization potential.

Fig. 22 shows the three element gaseous tube conducting electrons when the anode and grid are at the proper positive potentials. As shown by Fig. 23, to prevent this tube from passing anode current or firing, on an alternating anode voltage E_A, the negative value of grid voltage must exceed E_g, the grid bias characteristic. Fig. 24 shows a set of curves for the peak anode vs. grid volts of a typical tube. From Fig. 24 it may be observed that the tube will not fire or conduct anode current with 300 volts on the anode and the condensed mercury at a temperature of 45°C if the negative grid potential is at least 5 volts.

This tube is widely used as a trigger device and in many industrial control applications it functions as a contactor or relay. With practically no energy in the grid control circuit, this tube can control enormous values of energy. Tubes of this type are commercially known as *thyratrons.* With d.c. on the anode, the thyratron functions as a lock-in relay and with a.c. on the anode it functions as a contactor or relay.

C. *Fluorescent Lamp*

Mercury vapor is formed in the tube shown by Fig. 25 when the filaments in each end of the tube are heated. After a suitable heating period, a high voltage is impressed momentarily between the filaments. This voltage will cause the mercury vapor in the tube to ionize and glow. After the voltage discharge has once started the glow, the glow may be sustained on normal line voltages. The inside of the tube is coated with a fluorescent material which will give forth an extremely brilliant and efficient light when subjected to the ultra-violet rays of the mercury vapor glow discharge.

4. GASEOUS TUBES—COLD CATHODE

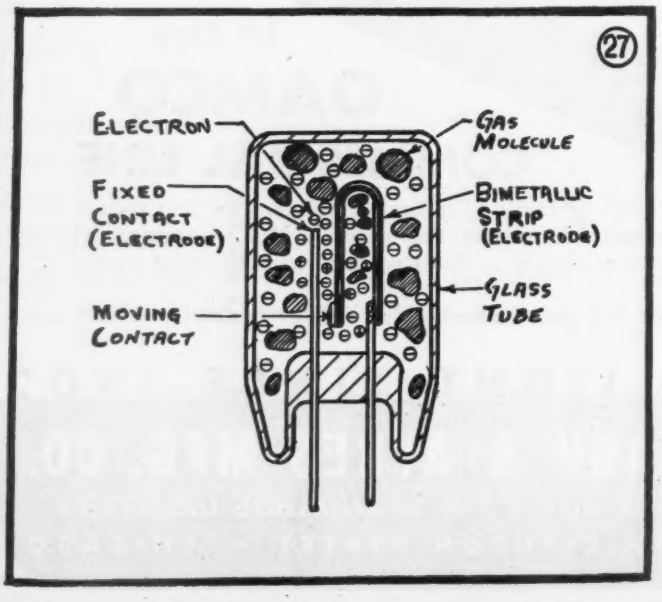
A. *Voltage Stabilizer Glow-tube*

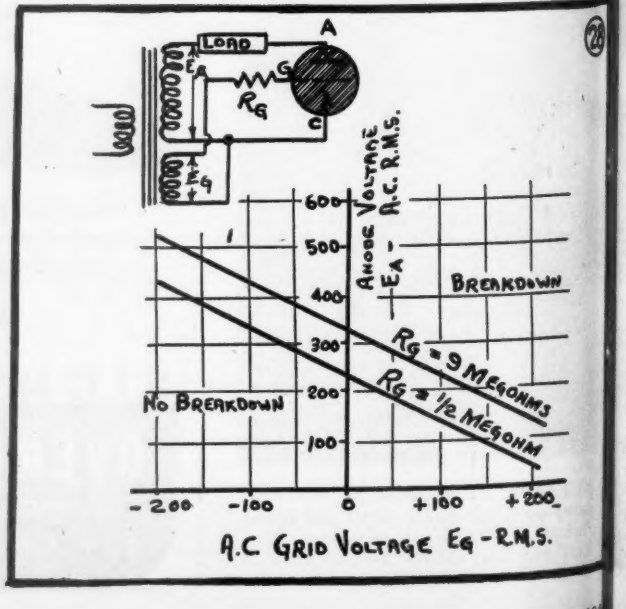
All the tubes previously described have had hot cathodes or filaments for electron emission. However, if an inert gas such as argon, neon, or helium is sealed in a two element tube, it is possible to initiate an ionization current of a limiting value through the gaseous medium without the necessity of a hot cathode electron emitter. Up to a critical value of voltage across the tube elements there will not be any current flow in the tube. However, when the striking or firing voltage at which the gas becomes ionized is attained, a discharge current passes through the tube and the voltage drop across the tube decreases. For a certain current range the voltage drop across the tube is almost constant regardless of the current flowing through it. Fig. 2[illegible] shows the characteristic curve of a voltage stabilizer (or voltage regulator) tube. The input voltage must always be such that the tube fires and a series resistor must be used so that the tube current does not exceed the rating for which the tube was designed. From this curve it can be seen that the voltage drop is almost constant for a wide range of current. At the gas ionization potential, the gas ionization time is in the order of 100 microseconds. An increase in starting voltage may reduce the time to 5 or 10 microseconds. A typical voltage stabilizer tube may operate at 105 volts and be suitable for a current range from 5 to 30 milliamperes. A tube of this rating requires a starting voltage of at least 137 volts.

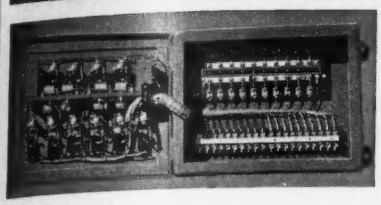
B. *Fluorescent Lamp Glow-tube Starter Switch*

When a critical value of voltage is impressed across the electrodes of the tube shown by Fig. 27, the gas in the tube will be ionized and a current will be conducted through the tube. A typical glow switch may employ a neon-argon gaseous medium which requires approximately 80 volts to initiate the

[Continued on page 146]







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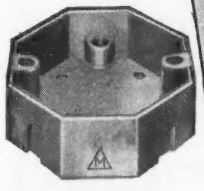

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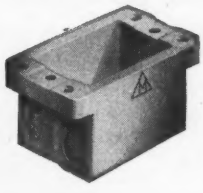

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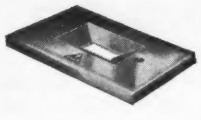

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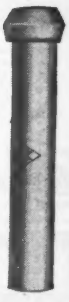

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Fundamentals of Electronic Tubes

[FROM PAGE 140]

discharge. One of the electrodes in this tube is made of bimetal and is arranged so that when it is heated, it will deflect toward a stationary electrode. The glow discharge current will heat the bimetallic electrode and it will contact the other when it is sufficiently heated. The time delay period or time for the electrodes to make contact is proportional to the discharge current and voltage impressed upon the tube. This device is used as an electronic switch or relay and is widely used as a starting switch for fluorescent lamps. It provides the necessary time delay for the heating of the lamp filaments and also provides a switching action for a reactor unit that will provide a voltage surge of sufficient value to ionize the gas in the lamps. This tube may also be used as a timing element in a motor starter or controller.

C. *Grid-glow Tube*

The addition of a grid to a two element cold cathode gaseous tube provides an extremely sensitive control device. At a critical value of grid voltage as shown by Fig. 28, a discharge will occur between the grid and the cathode. If the anode voltage is high enough, the discharge will immediately transfer from the grid to the anode. The grid and anode voltages may be adjusted so that the application of an extremely small and positive voltage applied to the grid will initiate the discharge. From the curves it can be seen that a charge in the external resistance of the circuit will initiate a discharge in the tube if the anode and grid voltages are held constant. This characteristic makes it possible to detect insulation deterioration which may be caused by water, dirt, or fire. It may also be used as a switching device for a photo-electric tube circuit. This tube has often been used in demonstration and protection equipment as it is so sensitive that it can be discharged by the capacity of a person's hand or body when brought into the immediate vicinity of the outer surface of the tube.

The next article in this series will take up the mercury pool tubes, including the ignitron. These heavy current tubes are the major circuit controls in such equipment as electronic welders and motor controls. They rectify large quantities of power for the manufacture of aluminum and magnesium. They are one of the most widely used industrial electronic tubes.

Tips on Explosion-Proof Wiring

[FROM PAGE 41]

enclosure in which arcing or sparking is likely to occur—as at motor terminals, switch boxes, etc.

b. Wherever a conduit leads from a hazardous to a non-hazardous location.

c. Within two feet of terminal and junction boxes to which conduit runs of 4-inch size or larger are connected.

The sealing compound must be of an approved type that is not affected by surrounding atmosphere and has a melting point not less than 90 degrees C. The compound seal must be at least $\frac{5}{8}$-inch thick. Most manufacturers of hazardous equipment supply an approved compound.

Condensation in explosion-proof conduit systems is something that may frequently be overlooked. Seals should be so located that water will not be trapped in the conduit. If there is such a possibility, the conduits should be so arranged that the water will collect in an explosion-proof sump which can be drained periodically.

Another point to remember is that splices should never be made in fittings intended only for sealing purposes nor should splicing fittings be filled with compound. Where equipment vibration is a factor, approved explosion-proof flexible tubing should be used.

4. *Careful Installation* — Explosion-proof wiring is in reality custom built work. Measurements must be accurate, since all threaded joints and couplings must have at least five full threads engaged. Special care must be taken in mounting to prevent sagging conduits which might strain threaded connections to the breaking point. Explosion-proof equipment being bulky and heavy requires adequate mounting supports. It takes more manpower per unit to handle this equipment than the conventional steel encased type, hence the need for insuring an adequate crew on the job.

The weight of such equipment runs from two to three times that of conventional units. This is an important factor in estimating.

Grounding is another phase of the installation that must receive careful attention. It is important that all motor frames, equipment enclosures, etc., be firmly bonded to a grounding system. Usually the conduit system is considered sufficient but many engineers design a ground network terminating in several driven grounds for such bonding purposes. Where threaded hubs are not provided and double locknut and bushings must be used, bonding jumpers with approved fittings should be installed.

Alphabetical Index to Advertisers

January, 1944

★ These companies have included Briefalogs, containing additional buying information on their products, in the 1944 edition of the Electrical Buyers' Reference.

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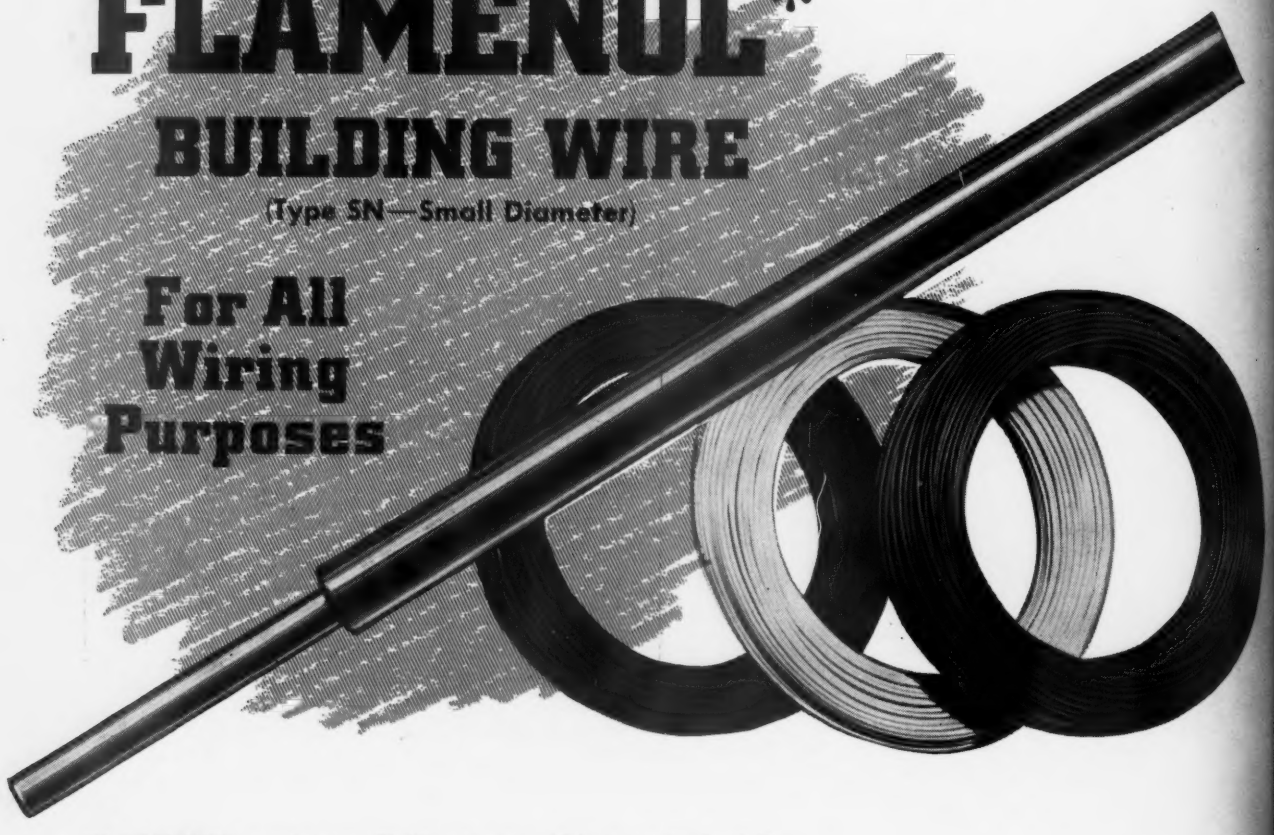

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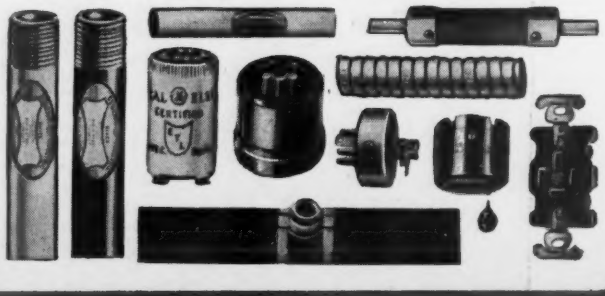

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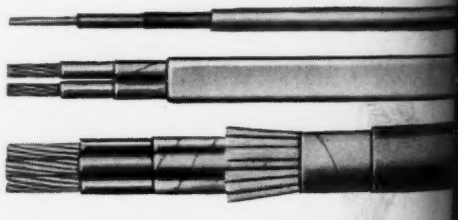

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